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BIRD-BANDING

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Bird-Banding

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WEIGHTS AND TEMPERATURES OF SOME MICHIGAN BIRDS[1]

By George B. Becker and Joseph W. Stack

Comparatively little is known about the weights and temperatures of birds as they exist in the wild state. In view of the lack of such data, the following work was begun in the fall of 1931. An exceptional opportunity for collecting data was made available through the bird banding station operated under the direction of Professor J. W. Stack at Michigan State College.

This station was inaugurated in 1923 by Professor Stack and has been active throughout each year with the exception of the summer session, from the last of June until the opening of college in the fall term, which is generally the last week in September.

Owing to the fact that the station has been in operation over such a long period of time, large numbers of birds tend to be attracted to this area by the constantly available food. Due to the elimination of many shrubs, trees, and wild cover about the campus, the annual catch has decreased during the last few years.

Trammel bird nets and various types of traps are used to capture the birds, at this station.

Review of Literature on Bird Temperatures

The late S. Prentiss Baldwin, in his book "Physiology of the Temperature of Birds", states that Pembery (1898) summarized most of the work on mammalian and human temperature observed at that time, including also work on the physiology of bird temperature. Alexander Wetmore (1921) published his work, "A Study of the Body Temperature of Birds", covering 327 species of birds totaling 1,558 records. He also summarized the work of Eydoux and Souleyet (1838), Brown Sequard (1858), Martins (1858), Milne Edwards (1863), Sutherland (1899), Simpson and Galbraith (1905–1912), Hilden and Stenback (1916), Bergtold (1917), and Weber (1918) covering 89 species.

The work on bird temperatures up to 1921 was done more for the purpose of securing temperatures on a large number of families rather than on large numbers of any particular species.

[1]Journal Article No. 545 (n.s.) Michigan State College Experiment Station. Mr. Becker submitted this paper in partial fulfillment of requirements for the degree of Master of Science.

Wetmore (1921) includes the conclusions of the following observers in his study: Simpson and Galbraith (1905–1912) from records of gulls, starlings, sparrow-hawks, a kestrel, thrushes, owls of several species, domestic fowls, ducks and pigeons. They found that birds normally active during the day showed a diurnal rhythm with a gradual rise in temperature reaching a maximum in the late afternoon and then gradually decreasing, reaching a minimum in the early morning. In nocturnal species the tendency was reversed, the bird reaching a maximum late at night with the minimum temperature during the day.

Hilden and Stenback (1916) by means of confining diurnal birds in a dark room and using artificial lights caused them to reverse their temperature rhythm, having the maximum at midnight and a minimum in the afternoon. When the birds were again allowed normal conditions they changed to their normal rhythm.

Wetmore concludes that large birds show a smaller daily range of variation in temperature than small birds. He based his conclusion on the work of Simpson and Galbraith (1905–1912), which gave the following ranges from maximum to minimum:

Thrush	7.5 degrees F.
Starlings	7.2 degrees F.
Domestic Fowl	1.9 degrees F.
Domestic Duck	1.8 degrees F.

Wetmore believes that birds have a higher temperature in the summer than in the winter due to the longer day in summer, which provides a longer period of activity.

Martins (1858) noted a higher temperature in the female than in the male of the domestic duck. Simpson and Galbraith (1905–1912) also obtained similar results on birds of other species. Hilden and Stenback (1916), basing their conclusions on a few records of other species of birds, found that the males had a higher temperature than the females. Wetmore agreed with the conclusions of Simpson and Galbraith by observing that females had a higher temperature than males, although he noted some exceptions.

Wetmore found that the females of the species studied had a slightly higher temperature than the males, but in some species the males showed a decidedly higher temperature reading than the females. In some species the temperatures of the two sexes were approximately the same. Wetmore believed that the sex showing the higher temperature was also the one that incubated the eggs. His data bear out this conclusion. He discovered that in passerine birds sharing these duties, the temperatures of both sexes were approximately the same. In shore birds Wetmore found that the male had a slightly higher temperature when both sexes incubate.

Leon Gardner (1926) secured the temperature of 24 species of nestling birds and found that under uniform conditions younger birds showed a lower temperature than those more fully developed. He also discovered that absence of the incubating parent, if prolonged, fatigue, hunger, illness or removal from the nest causes a decrease in the body temperature of the young bird.

S. Prentiss Baldwin (1932) by the use of a thermocouple arrangement was able to secure very extensive records on the temperature of the Eastern House Wren. His observations led to the following conclusions.

1. The normal body temperature of the Eastern House Wren and other passeriform species is characterized by great variableness.
2. Excitement, through its effect on activity and other functions, tends indirectly to increase the body temperature.
3. Under experimental conditions, the body temperature of adult birds is normally unaffected by fluctuations in air temperature so long as these fluctuations are not extreme and do not occur too rapidly.
4. Birds are more quickly and seriously affected by a rise in body temperature than by a lowering.
5. Variations in the rate of respiratory movements of adult birds are probably of significance in temperature regulation.
6. The skin temperature of passeriform birds is lower than that of the internal body temperature, varies in different regions and is not in all cases the same in the two sexes.
7. There is a decided and rather abrupt daily rhythm of body temperature in passeriform birds.
8. Young Eastern House Wrens are distinctly poikilothermic in their temperature reactions.

Review of Literature on Bird Weights

Sidney R. Esten (1931) reviewed the work of William VanGorder (1911–1923) who obtained records mainly on hawks and water birds, but he reported on some species which were also included in this paper. Mr. and Mrs. Charles L. Whittle (1925–1930) took records of bird weights at Cohasset, Massachusetts and at Peterboro, New Hampshire. Mr. Whittle concluded that individual variation is too great to determine correct weight averages from records of a small number of birds. However, he found that chickadees seemed to be an exception to the rule.

Dayton Stoner (1928) observed the weights of young Bank Swallows from birth until they left the nest and found that their weight increased up to the 11th to 13th day, when a decrease was noted. He thought this was primarily due to a re-absorption of fat, which develops but gradually diminishes as the time for leaving the nest approaches. At the time of the initial flight the birds weigh more than the average adult.

Maurice Broun (1932) took the weight and also the wing measure-

ment of several species of birds at Austin Ornithological Research Station in the fall of 1932. He states that the majority of the birds were weighed in the forenoon, when full crops might be expected. He states no conclusions on his work.

Mrs. Kenneth B. Weatherbee (1934) has taken records of weight, body length, wing, tail, tarsus and culmen of birds caught at Worcester, Massachusetts, and at Pomfret, Connecticut, from 1932–34. Her work was mainly on measurements of the different parts of the birds' bodies.

METHODS USED IN OBTAINING RECORDS OF BIRD WEIGHTS AND TEMPERATURES

The birds observed in these experiments were caught in the government type of sparrow trap or trammel bird net and then conveyed in carrying cages to the laboratory where they were weighed and their temperatures taken.

The time of capture of each bird was recorded in the data, but the length of its confinement in a cage at the laboratory varied, depending on the time when the writers were able to attend it. This confinement no doubt produced a physiological effect on weight and temperature.

The scales used in obtaining weights were secured from the W. M. Welch Scientific Company, Manitowoc, Wisconsin and were checked with a set of Standard Weights from the Bureau of Standards, Washington, D. C. by Professor Snow of the Physics Department of Michigan State College. The range of error was found to be .2 gram.

The first method used in obtaining weights was to put the bird into a cloth sack and fasten the sack onto the scales with a rubber band. This proved unsatisfactory, due to the accumulation of fecal deposit and the absorption of atmospheric moisture by the cloth sack. Metal cones proved most satisfactory as they prevented absorption, could be easily cleaned and prevented the bird from moving. In securing the net weight it was necessary to deduct the weight of the metal band on the bird's leg and the weight of the metal cone.

All weights were determined accurately to one-tenth of a gram. There was found to be a slight variation in the weight of the cones due to fluctuation in humidity and accumulation of dust. It was necessary to balance the scales and reweigh the cones frequently during the process of weighing.

A special bird-thermometer was made by the Will Corporation, Rochester, New York, and used throughout the period of this work.

Considerable individuality was shown by all species handled in

their reaction to having their weight and temperature taken. Birds caught the first time seemed excited and reluctant to open their bills for the insertion of the thermometer. However, repeats were generally docile, thereby facilitating the securing of their temperatures.

Wetmore and Baldwin found a variation of several degrees between the temperatures of the esophagus and the proventriculus, due perhaps to the poor peripheral circulation of the former. In the data in this paper the thermometer was inserted down to the region of the proventriculus. Since the instrument was so constructed that only a maximum temperature could be taken, the following data represent the maximum during the first three minutes following the insertion of the thermometer. It was found by taking the temperatures of birds over periods of from one to ten minutes that the reading reached a maximum during the first three minutes. Birds were held in such a way as to reduce body movement to a minimum. Since it was necessary to release the birds in order to study their migratory movements, no observations on pathological conditions or determination of sex could be made by means of post-mortem examinations.

S. Prentiss Baldwin and Alexander Wetmore have done the most extensive research on birds' temperatures. Wetmore obtained a few records on a large number of families, while Baldwin confined most of his work to the study of the Eastern House Wren.

The writers hoped by a study of large numbers of several species to obtain accurate averages on weights and temperatures and that some facts could be obtained on diurnal and seasonal variations of weights and temperatures. However, no accurate average could be determined on some species due to the limited number captured.

Possible Factors Involved in Studying Bird Weights and Temperatures

Before taking up a discussion of the data collected, it would be feasible to consider some of the factors that may be involved in the study of weights and temperatures.

The physical characters of the bird are involved in this study. In the animal kingdom the bird is considered to have the most rapid rate of metabolism, its katabolism being very high as compared with anabolism. Birds are partially able to regulate the heat of their bodies by producing heat in the contraction of muscles and the retention of heat by the insulating effect of their feathers. The bird has no sweat glands, but is able to regulate a high internal body temperature by the evaporation of moisture from the internal surfaces of the lungs and air sacs.

All the data in this paper were obtained from studies of migratory species and migration may be considered to affect weight and temperature.

Birds are considered to have the highest temperatures of the animal kingdom. For the purpose of comparison, temperatures quoted in "Handbook of Physiology" by Halliburton and McDowell (1930) are listed here. Since the Fahrenheit scale is used entirely throughout this paper, these temperatures have been transposed from the Centigrade scale.

	Centigrade	*Fahrenheit*
Human	36.5–37.5 degrees	98–99 degrees
Horse, Donkey, Ox	37.5–38.0 degrees	99.5–100.4 degrees
Dog, Cat	38.5–39.0 degrees	101.3–102.2 degrees
Sheep, Rabbit	38.0–39.5 degrees	100.4–103.1 degrees
Mouse	37.5 degrees	99.5 degrees
Rat	37.9 degrees	100.2 degrees
Birds	42.0 degrees	107.6 degrees

TABLE I

INITIAL WEIGHTS OF SPECIES OBSERVED

Species	*No. Incl.*	*Average (grams)*	*Minimum (grams)*	*Maximum (grams)*
Virginia Rail	1	69.9	....	....
Eastern Bob-White	6	194.4	177.1	206.5
Eastern Mourning Dove	21	130.8 ± 1.6	103.6	146.9
Eastern Hairy Woodpecker	1	62.1	....	....
Northern Downy Woodpecker	5	27.1	26.2	28.9
Yellow-bellied Sapsucker	2	46.7	44.2	49.1
Red-headed Woodpecker	5	79.2	70.5	88.0
Northern Flicker	1	137.6	....	....
Eastern Phoebe	1	16.9	....	....
Eastern Wood Pewee	1	13.1	....	....
Yellow-bellied Flycatcher	2	11.9	11.8	12.0
Alder Flycatcher	1	8.8	....	....
Northern Blue Jay	30	84.0 ± .7	70.4	96.3
Eastern Cowbird	41	46.0 ± .5	34.3	53.9
Baltimore Oriole	4	32.7	28.9	38.1
Bronzed Grackle	143	105.2 ± .7	83.5	137.0
Eastern Goldfinch	11	12.8 ± .2	11.4	14.0
Northern Pine Siskin	1	13.6	....	....
White-crowned Sparrow	48	32.1 ± .3	22.9	38.7
Gambel's Sparrow	1	27.1	....	....
White-throated Sparrow	375	27.2 ± .1	19.1	34.5
Eastern Tree Sparrow	3	16.6	15.4	18.5
Eastern Chipping Sparrow	19	13.0 ± .3	10.3	19.7
Eastern Field Sparrow	1	12.1	....	....
Slate-colored Junco	597	19.5 ± .1	14.7	27.6
Mississippi Song Sparrow	77	20.6 ± .1	17.3	25.2
Lincoln's Sparrow	8	18.5	15.2	20.1
Swamp Sparrow	2	16.9	16.4	17.4
Eastern Fox Sparrow	5	39.5	30.4	45.5
Red-eyed Towhee	6	40.7	35.2	45.1
Eastern Cardinal	23	44.6 ± .6	34.6	53.2

TABLE I (continued)

Species	*No. Incl.*	*Average (grams)*	*Minimum (grams)*	*Maximum (grams)*
Rose-breasted Grosbeak	2	44.8	43.9	45.7
Bank Swallow	20	14.0 ± .1	12.7	17.5
Cedar Waxwing	3	35.7	34.6	36.8
Blue-headed Vireo	1	14.4	....	....
White-eyed Vireo	1	11.3	....	....
Black and White Warbler	2	9.7	9.5	9.9
Magnolia Warbler	3	10.6	9.0	11.7
Chestnut-sided Warbler	1	8.3	....	....
Oven-bird	5	18.9	16.8	22.7
Mourning Warbler	3	11.0	10.3	11.7
Canada Warbler	2	9.5	8.8	10.1
American Redstart	2	7.5	7.0	7.9
Catbird	10	35.1 ± .5	31.2	39.0
Brown Thrasher	16	71.8 ± .7	65.1	82.3
Eastern House Wren	2	9.8	9.3	10.2
Brown Creeper	3	8.7	8.0	9.2
White-breasted Nuthatch	12	21.3 ± .1	19.6	22.9
Red-breasted Nuthatch	1	8.7	....	....
Tufted Titmouse	4	21.7	19.3	23.9
Black-capped Chickadee	19	10.3 ± .1	9.2	11.8
Eastern Golden-crowned Kinglet	9	6.5	6.0	6.9
Eastern Ruby-crowned Kinglet	5	6.4	6.1	6.6
Wood Thrush	1	47.7	....	....
Veery	1	35.9	....	....
Olive-backed Thrush	23	32.0 ± .1	24.6	39.4
Eastern Hermit Thrush	44	29.0 ± .2	23.8	35.3
Eastern Robin	54	74.1 ± .5	62.3	90.6

Total number of species—58.

TABLE II

INITIAL TEMPERATURES OF SPECIES OBSERVED

Species	*No. Incl.*	*Average (degrees)*	*Minimum (degrees)*	*Maximum (degrees)*
Eastern Bob-White	6	107.9	107.3	108.5
Eastern Mourning Dove	18	107.6 ± .2	105.3	109.5
Eastern Hairy Woodpecker	1	106.6	....	....
Northern Downy Woodpecker	3	107.3	106.9	107.6
Yellow-bellied Sapsucker	2	108.5	107.6	109.3
Red-headed Woodpecker	4	108.4	107.0	109.2
Northern Flicker	1	104.7	....	....
Eastern Phoebe	1	107.9	....	....
Northern Blue Jay	26	109.6 ± .1	107.7	111.6
Eastern Cowbird	38	110.2 ± .1	107.9	111.4
Baltimore Oriole	3	107.1	103.4	109.4
Bronzed Grackle	128	110.4 ± .1	106.9	112.7
White-crowned Sparrow	39	109.0 ± .1	105.9	110.8
Gambel's Sparrow	1	109.5	....	....
White-throated Sparrow	245	109.7	106.2	112.7
Eastern Tree Sparrow	2	110.8	110.0	111.5
Eastern Chipping Sparrow	15	109.5 ± .2	106.8	110.8
Slate-colored Junco	368	109.2	104.0	113.6
Mississippi Song Sparrow	64	109.6 ± .1	102.0	112.0
Lincoln's Sparrow	4	108.3	104.5	110.1

TABLE II (continued)

Species	*No. Incl.*	*Average (degrees)*	*Minimum (degrees)*	*Maximum (degrees)*
Swamp Sparrow	2	110.2	108.9	111.5
Eastern Fox Sparrow	5	109.1	107.8	110.4
Red-eyed Towhee	3	109.7	109.0	110.0
Eastern Cardinal	14	109.7 ± .2	106.0	112.0
Rose-breasted Grosbeak	1	108.1	....	....
Bank Swallow	31	109.1 ± .2	104.5	111.1
Magnolia Warbler	2	109.1	108.4	109.7
Oven-bird	3	108.5	107.5	109.7
Catbird	7	109.0	107.8	110.0
Brown Thrasher	13	109.8 ± .2	108.2	111.3
White-breasted Nuthatch	7	108.7	106.8	110.0
Red-breasted Nuthatch	1	102.7	....	....
Tufted Titmouse	2	108.2	108.1	108.3
Black-capped Chickadee	11	108.1 ± .4	104.1	111.3
Olive-backed Thrush	18	109.8 ± .2	107.9	112.1
Eastern Hermit Thrush	28	109.2 ± .2	104.3	110.9
Eastern Robin	48	109.5 ± .1	105.2	115.8

Total number of species—37

Birds are considered to be homothermic by all authors used as reference in this paper. The late Mr. S. Prentiss Baldwin (1932) in his work on nestling House Wrens found that the young birds were distinctly poikilothermic, but their development of temperature control is quite complete when the bird is nine days old, after which time it reacts as a homothermic animal. There are various factors affecting the temperature of the bird which have been published by Baldwin (1932) and Rowan (1931).

CONSIDERATION OF INITIAL WEIGHTS AND TEMPERATURES

Initial readings are those taken the first time a bird is captured. It should be kept in mind that the data in this paper were not obtained under constant conditions, but from mature birds under natural conditions.

In Table I there is a list of the average, maximum and minimum weights of the 58 species observed. There is a fairly large range in the weight of some species due probably to individual differences and the fluctuating abundance in available food. Considering the ten species having the largest number of weights recorded, the following ranges were found.

Species	*Records*	*Range*
Slate-colored Junco	597	12.9 grams
White-throated Sparrow	375	15.4 grams
Mississippi Song Sparrow	77	7.9 grams
Bronzed Grackle	143	53.5 grams
Eastern Cowbird	41	19.6 grams
Northern Blue Jay	30	25.9 grams
White-crowned Sparrow	48	15.8 grams

Eastern Robin	54	28.3 grams
Eastern Hermit Thrush	44	11.5 grams
Eastern Cardinal	23	18.6 grams

Range is the mathematical difference between the maximum and the minimum for the species.

Among the causes of variability may be listed immaturity, sex differences, malnutrition and glandular disturbances. Since the distribution of weights was of the normal type, the range may be due largely to individual characteristics. Since it was impossible to fully determine immature individuals, no assumption can be made on the effect of immaturity on weight range.

Table II gives the average, maximum and minimum temperatures of the species observed. It should be noted that temperatures fluctuate. Other observers have found that a bird's temperature may vary as much as ten degrees over the period of a single day.

The following ten species give some indication of the ranges in temperatures of birds.

Species	*Records*	*Range*
Slate-colored Junco	368	9.6 degrees
White-throated Sparrow	245	6.5 degrees
Mississippi Song Sparrow	64	10.0 degrees
Bronzed Grackle	128	5.8 degrees
Eastern Cowbird	38	3.5 degrees
Northern Blue Jay	26	3.9 degrees
White-crowned Sparrow	39	4.9 degrees
Eastern Robin	48	10.6 degrees
Eastern Hermit Thrush	28	6.6 degrees
Eastern Mourning Dove	18	4.2 degrees

This variability may be a character inherited from the bird's reptilian ancestors. This, however, remains to be proven. The studies made for this paper were not broad enough in scope to attribute the variation to any one factor or group of factors. The variation found in the data presented may possibly be due to inclusion of immature individuals not having reached the age of temperature control. However, since immature individuals can be determined in many of the species studied which have a decided variability in temperature, this factor can hardly be considered as important in all species.

In computing the correlation between average weight and average temperature of the ten representative species of birds giving a normal range from small to the large birds found in the following paragraph, a coefficient of $-.30-.186$ is obtained. This coefficient is low and is not statistically significant, but it suggests there may be a tendency for larger birds to have a lower body temperature than smaller birds. The above data fail to demonstrate this point.

The ten species studied in obtaining the coefficient of correlation

for weight and temperature are.

Species	*Average Weight*	*Number of Records*	*Average Temperature*	*Number of Records*
Slate-colored Junco	19.5 grams	597	109.2 degrees	368
White-throated Sparrow	27.2 grams	375	109.7 degrees	245
Mississippi Song Sparrow	20.6 grams	77	109.6 degrees	64
Bronzed Grackle	105.2 grams	143	110.4 degrees	128
Eastern Cowbird	46.0 grams	41	110.2 degrees	38
Northern Blue Jay	84.0 grams	30	109.6 degrees	26
White-crowned Sparrow	32.1 grams	48	109.0 degrees	39
Eastern Robin	74.1 grams	54	109.5 degrees	48
Eastern Hermit Thrush	29.0 grams	44	109.2 degrees	28
Eastern Mourning Dove	130.8 grams	21	107.6 degrees	18

TABLE III

DIURNAL VARIATION IN WEIGHT

Band Number	*Time of Day*	*Average Weight*	*Number of Records*
	SLATE-COLORED JUNCO		
C30788	A.M.	16.4	1
	P.M.	17.4	7
C30793	A.M.	16.7	3
	P.M.	17.0	8
C30796	A.M.	16.8	5
	P.M.	17.3	9
C30810	A.M.	16.9	7
	P.M.	17.5	18
C30827	A.M.	16.4	1
	P.M.	17.8	10
C30838	A.M.	16.9	3
	P.M.	17.8	9
C30967	A.M.	19.6	3
	P.M.	19.7	8
C30999	A.M.	20.0	9
	P.M.	20.4	3
F78026	A.M.	15.6	8
	P.M.	15.9	8
F78044	A.M.	18.2	9
	P.M.	18.5	13
F78122	A.M.	15.6	19
	P.M.	15.7	19
A182132	A.M.	17.7	5
	P.M.	19.8	8
F78422	A.M.	18.7	2
	P.M.	19.8	8
B90438	A.M.	19.5	3
	P.M.	20.5	2
	WHITE-THROATED SPARROW		
C30744	A.M.	21.5	4
	P.M.	21.1	6
C30749	A.M.	17.8	5
	P.M.	19.6	9
C30799	A.M.	19.0	4
	P.M.	20.4	5
C30815	A.M.	21.6	4

	P.M.	20.7	3
C30825	A.M.	24.8	13
	P.M.	25.1	29
C30828	A.M.	27.1	4
	P.M.	28.8	3
C30304	A.M.	26.4	13
	P.M.	28.0	15
C30352	A.M.	26.9	5
	P.M.	26.5	2
A173829	A.M.	23.3	3
	P.M.	22.3	7
	MISSISSIPPI SONG SPARROW		
F78003	A.M.	19.6	5
	P.M.	19.7	6
	EASTERN COWBIRD		
A256781 (Male)	A.M.	47.2	5
	P.M.	47.0	7
	NORTHERN BLUE JAY		
107829	A.M.	90.0	5
	P.M.	87.9	3

TABLE III (continued)

Band Number	*Time of Day*	*Average Weight*	*Number of Records*

DIURNAL VARIATION IN WEIGHT

One determination of weight or temperature for an individual bird tells us nothing about its diurnal variation. Hence it is desirable to study the data for repeaters, i.e., those which were captured ten or more times. Records taken from 8–10 A.M. are considered as morning records and those from 4–6 P.M. are considered as afternoon records in this discussion. The selection of these two periods with an interval between of six hours eliminates any chance of confusing the data, since it was possible that some birds caught in the morning might not have been weighed until early afternoon and this confinement would affect the data. There is no overlapping of morning and afternoon records with the interval selected in this work.

From a study of Table III it can be seen that all of the Slate-colored Junco repeaters show a gain in weight in the afternoon over the morning record. The gains range from a minimum of .1 gram to a maximum of 2.1 grams. One possible explanation for this gain may be that the afternoon records were taken after feeding.

The White-throated Sparrows show a great deal of variability, some birds showing a gain in weight and others a loss in the afternoon records as compared with those of the morning. This loss may possibly be accounted for by the small number of records obtained. It would be interesting to secure a large number of records on repeaters and determine the actual state that exists in the case of the White-throated Sparrows.

Table III has the Mississippi Song Sparrow showing a slight gain

in weight and the Eastern Cowbird and Northern Blue Jay showing a loss in the afternoon records as compared with those of the morning. With a small number of records it is inaccurate to draw any definite conclusions. A larger number of records should be taken to determine whether there is a gain or loss in the afternoon as compared with the morning records.

Bird numbered C30825 is an interesting case since it repeated 57 times from October 11, 1931 to December 1, 1931. This bird had a growth covering one-half of its right eye and one of its legs was paralyzed. These physical handicaps explain why it depended on going into the traps for food. It was very quiet, when handled, and did not seem excited at any time. Its weight seemed quite constant on the records obtained throughout the day.

Variation might possibly depend on kind and amount of food eaten by the bird during the day and the activity of the bird.

TABLE IV

DIURNAL VARIATION IN TEMPERATURE

Band Number	*Time of Day*	*Average Temperature*	*Number of Records*
	SLATE-COLORED JUNCO		
C30788	A.M.	109.0	1
	P.M.	109.9	7
C30793	A.M.	111.5	3
	P.M.	110.0	8
C30796	A.M.	110.4	5
	P.M.	111.0	9
C30810	A.M.	110.2	7
	P.M.	110.7	18
C30838	A.M.	110.4	3
	P.M.	110.1	9
C30967	A.M.	110.5	3
	P.M.	110.3	8
C30999	A.M.	109.7	9
	P.M.	110.5	3
F78026	A.M.	110.0	9
	P.M.	111.2	7
F78044	A.M.	110.3	11
	P.M.	110.7	13
F78122	A.M.	110.0	17
	P.M.	111.0	19
A182132	A.M.	110.7	5
	P.M.	110.6	6
B90438	A.M.	110.6	3
	P.M.	111.3	2
	WHITE-THROATED SPARROW		
C30744	A.M.	109.0	4
	P.M.	109.9	6
C30749	A.M.	109.1	5
	P.M.	110.7	9
C30799	A.M.	109.1	3

TABLE IV (continued)

Band Number	*Time of Day*	*Average Temperature*	*Number of Records*
	P.M.	109.8	5
C30815	A.M.	109.1	4
	P.M.	109.2	3
C30825	A.M.	110.6	13
	P.M.	110.8	29
C30828	A.M.	109.7	4
	P.M.	109.4	3
C30304	A.M.	109.2	2
	P.M.	110.3	3
	MISSISSIPPI SONG SPARROW		
F78003	A.M.	109.2	5
	P.M.	110.9	6
	EASTERN COWBIRD		
A256781 (Male)	A.M.	111.2	5
	P.M.	111.7	7
	NORTHERN BLUE JAY		
107829	A.M.	110.7	5
	P.M.	110.5	3

DIURNAL VARIATION IN TEMPERATURE

From a study of the diurnal variation in temperature of the Slate-colored Junco in Table IV it can be seen that some individuals show a gain and others a loss in the afternoon records as compared with those of the morning. This statement also holds true in the case of the White-throated Sparrow. The single records of the Mississippi Song Sparrow and the Eastern Cowbird both show gains in the afternoon period. The single record of the Northern Blue Jay shows a slight loss in temperature in the afternoon records as compared with those of the morning. Temperature has already, in this paper, been noted to be highly variable, so the only possible conclusion is that some birds show a loss and others a gain in the afternoon temperature records as compared with the morning records.

Simpson and Galbraith (1905–1912) and Baldwin (1932) found the temperatures to be at a maximum in the afternoon. As in the case of weights, in order to secure conclusive results, it would be necessary to make records frequently during the day on the same individuals over a long period of time. This is not possible under natural conditions since the birds do not re-enter the traps regularly. Baldwin (1932) and Wetmore (1921) have found that an individual's temperature may vary several degrees during the day.

TABLE V
AVERAGE WEIGHTS AND TEMPERATURES OF REPEATS
SLATE-COLORED JUNCO

TABLE V (continued)

Band Number	*Average Weight*	*Number of Records*	*Average Temperature*	*Number of Records*
C30788	16.9 grams	13	109.9 degrees	13
C30793	16.8 grams	15	110.5 degrees	14
C30796	17.3 grams	16	110.8 degrees	16
C30810	17.2 grams	31	110.4 degrees	31
C30827	17.4 grams	14	110.8 degrees	13
C30838	17.6 grams	15	110.2 degrees	15
C30869	16.8 grams	10	....	..
C30967	19.6 grams	16	110.1 degrees	16
C30968	21.9 grams	21	110.4 degrees	20
C30999	20.1 grams	13	109.9 degrees	13
F78026	15.7 grams	16	110.5 degrees	16
F78044	18.3 grams	23	110.6 degrees	25
F78122	15.6 grams	38	110.6 degrees	36
A182078	18.4 grams	11	....	..
F78289	18.0 grams	10	....	..
A182132	19.0 grams	24	110.9 degrees	18
F89442	19.3 grams	21	110.9 degrees	12
B90438	20.6 grams	10	110.4 degrees	9
	WHITE-THROATED SPARROW			
C30744	21.4 grams	13	109.3 degrees	13
C30749	19.1 grams	21	110.0 degrees	21
C30799	19.5 grams	13	109.5 degrees	12
C30815	21.5 grams	10	109.1 degrees	10
C30825	24.6 grams	57	110.6 degrees	56
C30828	28.4 grams	12	109.8 degrees	12
C30304	27.1 grams	35	110.0 degrees	6
C30352	25.2 grams	13	....	..
A173829	23.2 grams	11	....	..
	MISSISSIPPI SONG SPARROW			
F78003	19.7 grams	11	110.1 degrees	11
B90414	20.0 grams	10	110.9 degrees	10
	EASTERN COWBIRD			
A256781 (Male)	47.1 grams	12	111.5 degrees	12
	NORTHERN BLUE JAY			
107829	90.3 grams	13	110.4 degrees	13
	BLACK-CAPPED CHICKADEE			
C30930	10.9 grams	12	109.5 degrees	12

CONSIDERATION OF AVERAGE WEIGHTS AND TEMPERATURES OF REPEATERS

Table V shows the average weights and temperatures of repeaters (those caught 10 or more times). The majority of the Slate-colored Junco and White-throated Sparrow repeaters show a weight average less than the average determined for the whole species record. The sample of the whole species includes birds caught one or more times, so for this larger group a different average weight might be expected.

The Mississippi Song Sparrow repeaters are also both under the average weight determined for the sample of the whole species. The Eastern Cowbird, Northern Blue Jay and Black-capped Chickadee have higher average weights in repeaters than in the sample for the entire species.

The writers are unable to explain why repeater average weights are, in general, lower than those of the whole species sample. The variation in number of records of repeats as compared with the whole species sample may possibly be a factor. Possible preponderance of one sex in either sample may also be a factor.

In considering the temperatures in Table V, we find in the case of the majority of the birds of each species that the repeater average temperature is higher than the sample for the whole species. Since temperature has already been noted to be highly variable, the writers are unable to explain the variation other than possibly being due to the variation in the number of records of the repeater and whole species sample.

TABLE VI

COMPARISON OF WEIGHTS WITH OTHER OBSERVERS

Species	*Number of Records*	*Average Weight*	*Observer*
Brown Creeper	3	8.7 grams	Becker and Stack
	1	6.6 grams	Maurice Broun
Black-capped Chickadee	19	10.3 grams	Becker and Stack
	1	10.0 grams	Maurice Broun
	58	11.1 grams	Mrs. Wetherbee
Eastern Golden-crowned Kinglet	9	6.5 grams	Becker and Stack
	1	7.3 grams	Maurice Broun
Eastern Ruby-crowned Kinglet	5	6.4 grams	Becker and Stack
	1	5.8 grams	Maurice Broun
Red-eyed Towhee	6	40.7 grams	Becker and Stack
	1	36.97 grams	Maurice Broun
	14	40.6 grams	Mrs. Wetherbee
Eastern Tree Sparrow	3	16.6 grams	Becker and Stack
	2	17.4 grams	Maurice Broun
	48	19.59 grams	Mrs. Wetherbee
Eastern Chipping Sparrow	19	13.0 grams	Becker and Stack
	4	12.8 grams	Maurice Broun
	97	12.53 grams	Mrs. Wetherbee
	14	13.00 grams	Whittle
White-throated Sparrow	375	27.2 grams	Becker and Stack
	1	22.5 grams	Maurice Broun
	10	29.9 grams	Whittle
	4	27.26 grams	Mrs. Wetherbee
Swamp Sparrow	2	16.9 grams	Becker and Stack
	1	15.7 grams	Maurice Broun
Northern Downy Woodpecker	5	27.1 grams	Becker and Stack
	1	27.0 grams	Whittle
	3	28.1 grams	Mrs. Wetherbee

TABLE VI (continued)

Species	*Number of Records*	*Average Weight*	*Observer*
Northern Blue Jay	30	84.0 grams	Becker and Stack
	2	95.0 grams	Whittle
	44	89.22 grams	Mrs. Wetherbee
Eastern Cowbird	41	46.0 grams	Becker and Stack
	9	42.76 grams	Whittle
White-crowned Sparrow	48	32.1 grams	Becker and Stack
	3	30.8 grams	Whittle
	7	31.27 grams	Mrs. Wetherbee
Eastern Fox Sparrow	5	39.5 grams	Becker and Stack
	6	40.2 grams	Whittle
	16	40.28 grams	Mrs. Wetherbee
Eastern Robin	54	74.1 grams	Becker and Stack
	2	83.5 grams	Whittle
	16	76.6 grams	Mrs. Wetherbee
Slate-colored Junco	597	19.5 grams	Becker and Stack
	13	21.0 grams	Whittle

COMPARISON OF DATA WITH THOSE OF OTHER OBSERVERS

Table VI gives the average weights of 16 species observed by Maurice Broun, Mrs. Wetherbee, Charles Whittle and the writers. The average weights of the other observers vary from the same reading to as much as 11 grams as compared with the writers averages. Since the scales used in the data records of this paper were accurately checked by standard weights this difference can not be accounted for by any inaccuracy of the writers' scales.

From a study of Table I it is noted that all species are somewhat variable in their weights, in some cases reaching a range of 53.5 grams. These variations in the average weights of the previously named observers as compared with the writers could easily be explained as within the possible range for the species. The small number of records in some cases would give more importance to that particular average than it deserved. Only by the use of a large number of records can an accurate average be found.

It is interesting to note the difference in weight between the subspecies of the Song Sparrow.

Subspecies	*Number of Records*	*Average Weight*	*Observer*
Eastern Song Sparrow (*Melospiza melodia melodia*)	29	22.52 grams	Whittle
	94	21.88 grams	Mrs. Wetherbee
Mississippi Song Sparrow (*Melospiza melodia beata*)	77	20.6 grams	Becker and Stack

The eastern form of Song Sparrow has from 1.28 to 1.92 grams higher weight than the form of the Mississippi Valley region. Whether this difference is statistically significant or not cannot be determined since Whittle, and Mrs. Wetherbee neglected to state

the probable error of the mean in their data.

The differences between the weight averages listed by the various observers may be due to variations in the abundance and types of food in the localities where the birds were captured, differences in the sex ratios of the samples, or differences in the number of records of the observers.

TABLE VII

COMPARISON OF TEMPERATURES WITH OTHER OBSERVERS

Species	*Number of Records*	*Average Temperature*	*Observer*
Eastern Bob-White	6	107.9	Becker and Stack
	7	107.95	Wetmore
	1	111.2	Baldwin
Eastern Fox Sparrow	5	109.1	Becker and Stack
	5	109.3	Wetmore
Eastern Hairy Woodpecker	1	106.6	Becker and Stack
	4	108.45	Wetmore
Northern Downy Woodpecker	3	107.3	Becker and Stack
	9	107.75	Wetmore
	3	108.25	Baldwin
Northern Flicker	1	104.7	Becker and Stack
	2	109.1	Wetmore
	2	108.35	Baldwin
Red-headed Woodpecker	4	108.4	Becker and Stack
	2	108.3	Wetmore
Eastern Phoebe	1	107.9	Becker and Stack
	2	110.45	Baldwin
Eastern Cowbird	38	110.2	Becker and Stack
	6	108.15	Wetmore
Baltimore Oriole	3	107.1	Becker and Stack
	2	109.1	Wetmore
Bronzed Grackle	128	110.4	Becker and Stack
	1	109.6	Wetmore
White-crowned Sparrow	39	109.0	Becker and Stack
	6	108.95	Wetmore
White-throated Sparrow	245	109.7	Becker and Stack
	5	110.2	Wetmore
Eastern Chipping Sparrow	15	109.5	Becker and Stack
	2	108.75	Wetmore
Slate-colored Junco	368	109.2	Becker and Stack
	11	108.7	Wetmore
Red-eyed Towhee	3	109.7	Becker and Stack
	3	110.0	Wetmore
Eastern Cardinal	14	109.7	Becker and Stack
	9	109.3	Wetmore
Mississippi Song Sparrow	64	109.6	Becker and Stack
	15	109.1	Wetmore
Lincoln's Sparrow	4	108.3	Becker and Stack
	2	107.8	Wetmore
Swamp Sparrow	2	110.2	Becker and Stack
	4	108.9	Wetmore
Eastern Mourning Dove	18	107.6	Becker and Stack
	13	108.35	Wetmore

TABLE VII (continued)

Species	*Number of Records*	*Average Temperature*	*Observer*
Magnolia Warbler	2	109.1	Becker and Stack
	9	107.85	Wetmore
Oven-bird	3	108.5	Becker and Stack
	3	107.4	Wetmore
Catbird	7	109.0	Becker and Stack
	3	108.65	Wetmore
	1	108.4	Baldwin
White-breasted Nuthatch	7	108.7	Becker and Stack
	6	107.7	Wetmore
Red-breasted Nuthatch	1	102.7	Becker and Stack
	8	107.9	Wetmore
Tufted Titmouse	2	108.2	Becker and Stack
	5	109.1	Wetmore
Black-capped Chickadee	11	108.1	Becker and Stack
	4	108.3	Wetmore
Olive-backed Thrush	18	109.8	Becker and Stack
	4	109.35	Wetmore
Eastern Hermit Thrush	28	109.2	Becker and Stack
	7	108.45	Wetmore
Eastern Robin	48	109.5	Becker and Stack
	9	109.75	Wetmore
	5	109.55	Baldwin

Table VII gives the average temperatures of 30 species as observed by Baldwin, Wetmore and the writers. In no instance does the average vary more than 4 degrees. It has previously been noted that a bird's temperature is subject to a great variability, therefore the writers have no proof that the variations are not those to be expected as a result of natural conditions. Only birds whose temperatures were taken by means of clinical thermometers are considered in this discussion. Where Baldwin and Wetmore indicated sex differences, the average of the male and female were secured for comparative purpose. Mr. Wetmore secured the majority of his records from birds immediately after killing, while the writers records were obtained entirely from living birds.

Some of Baldwin's records secured by the use of the thermocouple are.

Species	*Number of Records*	*Average (in degrees)* *Male*	*Female*
Eastern Chipping Sparrow	9	104.84	104.0
Eastern Robin	2	104.5	104.6
Northern Downy Woodpecker	1	104.3	....
Eastern Hairy Woodpecker	1	....	105.0

These records are noticeably lower than the averages secured by the writers through the use of the clinical thermometer. The writers by use of the thermometer secured the maximum temper-

ature within the first three minutes of taking temperature of each bird. Baldwin by the use of the thermocouple was able to record any drops in temperature. It might be expected that thermocouple readings would be lower than those of a clinical thermometer since it records any drop in temperature after reaching a maximum. It was impossible to secure this reading with a clinical thermometer.

Possible factors which may be involved in temperature variation of the readings of the observers are.

1. Differences in the sex ratios of the groups investigated.
2. Differences due to diurnal variation.
3. Differences in the number of records of the various observers.
4. Pathological conditions.

TABLE VIII

SEASONAL VARIATION WITHIN SPECIES

Season	*Records*	*Average*	*Minimum*	*Maximum*	*Standard Deviation*
		WHITE-THROATED SPARROW			
		Weights			
Fall 1931	30	25.6 ± .2	21.5	29.5	1.8
Fall 1932	111	25.0 ± .1	19.1	31.5	2.2
Spring 1932	102	29.3 ± .1	24.5	34.5	2.0
Spring 1933	132	27.8 ± .1	22.4	34.2	2.1
		Temperatures			
Fall 1931	29	109.0 ± .2	106.2	111.2	1.2
Fall 1932	61	110.1 ± .1	108.1	111.6	.9
Spring 1932	100	109.8 ± .1	106.5	112.7	.9
Spring 1933	55	109.5 ± .1	107.7	111.3	.7
		SLATE-COLORED JUNCO			
		Weights			
Fall 1931	141	18.6 ± .1	15.2	22.1	1.3
Fall 1932	233	18.8 ± .1	14.7	23.9	1.5
Spring 1932	102	21.2 ± .1	15.3	26.8	2.2
Spring 1933	97	20.5 ± .1	16.4	27.6	1.8
		Temperatures			
Fall 1931	133	108.9 ± .1	104.0	112.1	1.5
Fall 1932	36	109.7 ± .1	107.0	113.6	1.2
Spring 1932	99	109.7 ± .1	106.9	112.2	1.0
Spring 1933	82	108.8 ± .1	104.3	111.0	1.2
		MISSISSIPPI SONG SPARROW			
		Weights			
Fall 1931	9	21.2 ± .4	19.2	24.1	1.7
Fall 1932	11	20.1 ± .2	19.2	22.3	.7
Spring 1932	34	20.9 ± .1	18.6	23.6	1.2
Spring 1933	23	20.2 ± .3	17.3	25.2	1.8
		Temperatures			
Fall 1931	8	107.9 ± .6	102.0	110.8	2.6
Fall 1932	6	109.4 ± .3	108.2	111.5	.9
Spring 1932	30	110.2 ± .1	107.7	111.8	1.1
Spring 1933	20	109.6 ± .2	106.5	111.0	1.2

COMPARISON OF SEASONAL VARIATION IN WEIGHT WITHIN THE SPECIES

Three species are to be considered in this discussion: the White-throated Sparrow, Slate-colored Junco, and Mississippi Song Sparrow, since only the number of their records warrants the formulation of conclusions. Table VIII gives the records of seasonal variation to the species studied.

WHITE-THROATED SPARROW

Fall 1931	25.6 grams average weight
Spring 1932	29.3 grams average weight
difference	3.7 grams

Since this gain in the spring is more than three times the probable error of the difference of .23 grams it is statistically significant.

Fall 1932	25.0 grams average weight
Spring 1933	27.8 grams average weight
difference	2.8 grams

The difference is significant since it is more than three times the probable error of the difference of .18 grams.

SLATE-COLORED JUNCO

Fall 1931	18.6 grams average weight
Spring 1932	21.2 grams average weight
difference	2.6 grams
Probable error of the difference	.168 grams

The gain is significant.

Fall 1932	18.8 grams average weight
Spring 1933	20.5 grams average weight
difference	2.3 grams
Probable error of the difference	.141 grams

This gain is significant.

MISSISSIPPI SONG SPARROW

Fall 1931	21.2 grams average weight
Spring 1932	20.9 grams average weight
difference	.3 grams
Probable error of the difference	.41 grams
Fall 1932	20.1 grams average weight
Spring 1933	20.2 grams average weight
difference	.1 grams
Probable error of the difference	.296 grams

There is no significant gain or loss.

The fall records are those taken from October 1st to December 31st and the spring records are those taken from March 1st to June 30th.

In the case of the White-throated Sparrow and Slate-colored Junco there is a decided gain in the spring season over the record

of the preceding fall season. The Mississippi Song Sparrow retains about the same weight in the fall and spring despite migration, nest building, and rearing of the young in the spring.

The following factors should be considered in drawing definite conclusions concerning weight variation in the different seasons.

1. Sex ratios in the records.
2. Varying number of records in each season.
3. Abundance of food in the different seasons.
4. Individuality of weight difference.
5. Pathological conditions.
6. Number of adults and immature birds in records.
7. Migration.

However, in this study it was impossible to isolate these factors to study their effect on the weight of the bird.

COMPARISON OF SEASONAL VARIATION IN TEMPERATURE WITHIN THE SPECIES[1]

WHITE-THROATED SPARROW

Fall (1931)	109.0 degrees average temperature
Spring 1932	109.8 degrees average temperature
difference	.8 degree
Probable error of the difference	.161 degree

This gain is significant.

Fall 1932	110.1 degrees average temperature
Spring 1933	109.5 degrees average temperature
difference	.6 degree
Probable error of the difference	.101 degree

This loss is significant.

SLATE-COLORED JUNCO

Fall 1931	108.9 degrees average temperature
Spring 1932	109.7 degrees average temperature
difference	.8 degree
Probable error of the difference	.114 degree

This gain is significant.

Fall 1932	109.7 degrees average temperature
Spring 1933	108.8 degrees average temperature
difference	.9 degree
Probable error of the difference	.168 degree

The loss is significant.

MISSISSIPPI SONG SPARROW

Fall 1931	107.9 degrees average temperature
Spring 1932	110.2 degrees average temperature
difference	2.3 degrees
Probable error of the difference	.634 degree

This gain is significant.

[1]Table VIII also gives the seasonal temperature variations in the species studied.

Fall 1932	109.4 degrees average temperature
Spring 1933	109.6 degrees average temperature
difference	.2 degree
Probable error of the difference	.317 degree

There is no significant gain or loss.

The White-throated Sparrows and Slate-colored Juncos show a gain in temperature in the first spring and a loss in the second spring over the preceding fall seasons. The writers are unable to account for this variation. There seems to be a good deal of variation in seasonal temperature records, in some cases showing a gain and in others a loss. Keeping in mind that temperature is apt to vary greatly during 24 hours, the only conclusion which these data warrant is that season has little if any effect on temperature.

Data concerning other species observed are too scant to justify any discussion.

DISCUSSION

The discussions in this paper have considered several facts concerning bird weights and temperatures. Since the writers obtained their records under approximately natural environmental conditions there was no control on the factors involved or any determination made of the relative importance of each. A study should be made of weights and temperatures throughout the day with a control placed on the factors and, also, to ascertain the factors involved and the importance of each in affecting weight or temperature. We have definitely proven that there is a large range in weight and temperature within the species. The factors directly responsible have not been determined. Baldwin (1932) and Wetmore (1921) have found that an individual bird may vary as much as ten degrees in temperature during 24 hours. Could this variation possibly show some tendency toward an inherent characteristic received from the bird's poikilothermic, reptilian ancestors? Mammals do not have this wide fluctuation in temperature.

It has been noted that larger birds show a slight tendency to have a lower average weight than the smaller species. Possibly the larger birds may have a slower rate of metabolism than smaller birds. This has not been determined. In general it is found that birds show a heavier weight in the afternoon records than those taken for the morning. This may be due to a heavier feeding between the morning and afternoon records. It is not possible to draw any conclusion concerning diurnal variation in temperature from the data in this paper. We find that average weights for repeaters seem to average lower than the average sample of the whole species, while the average temperature of repeaters seem, in general, to

average higher. Records of the various observers discussed seem to approximate a similarity considering the possible variation due to natural conditions.

White-throated Sparrows and Slate-colored Juncos seem to be affected by seasonal changes in showing a gain in weight in the spring over the preceding fall records. Seasonal changes apparently have no effect on temperature. The Mississippi Song Sparrows retain approximately the weight and temperature in both the fall and spring seasons.

It will be necessary to carry out experiments under controlled conditions to determine the causes of variation in weight and temperature.

GENERAL CONCLUSIONS

1. There is a decided variation in bird weights and temperatures.
2. There is a slight indication that larger birds have a lower average body temperature than the smaller species.
3. Repeater weights average lower and their temperatures average higher than the average sample of the whole species.
4. The Slate-colored Junco and the White-throated Sparrow show a gain in weight in the spring from the preceding fall.
5. There is no seasonal effect on temperature variation in the data.

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CAPTURING BARN SWALLOWS AND CHIMNEY SWIFTS AT NIGHT

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READERS of *Bird-Banding* will recall E. A. McIlhenny's fascinating account of capturing birds at night, which appeared in the January, 1942, issue. The present writer was especially interested in that paper, for he, too, has been a confirmed night hunter for several years.

While vacationing in the Catskills in 1939, I discovered the thrills which await every night hunter. One night I chanced to walk through a barn, near our place, in which a pair of Barn Swallows (*Hirundo erythrogaster*) had nested earlier in the season. Something prompted me to flash my light up at the old nest as I passed under it, and there sat one of the adult swallows. I returned to our cottage, where I fastened my trout landing net to a short pole, provided myself with a powerful flashlight, and then sallied forth. Quietly entering the barn, I walked to a spot directly beneath the nest, which was plastered to a beam about eight feet above the floor. I was amazed at how easily this swallow was captured—I merely snapped the light on the bird and quickly slipped the net

over it. I have been capturing Barn Swallows at night ever since.

After this initial success I later enlarged my activities to include Chimney Swifts (*Chaetura pelagica*). The first swifts I captured were taken in an unused silo, in which they were nesting, by sweeping them up in the net as they fluttered about. An excellent opportunity for banding is offered by swifts nesting in low barns or icehouses, for then the roosting birds are within easy reach of the net and can be pinned against the wall before they have a chance to fly. Even if the birds should take wing before you are ready for action, they will soon alight, perhaps on another wall, because the type of flight they employ under these circumstances is very tiresome.

Since those first experiences, I have learned a few things about the respective species which should be useful to those who may wish to capture birds at night. Every move one makes in the immediate attempt at netting a bird, be it swallow or swift, must be done speedily and deftly. The element of surprise is most important, not only in time saved but also in the increased number of captures. Having located a nest during the day, the bander returns after dark and, without using a light, approaches it cautiously. When close enough, raise the net slightly and snap your light on the nest. Now if the nest is a Barn Swallow's, both birds will usually be found perched on it. They will stare into the light for a few moments before taking flight. Clearly, your problem is to net them before they fly, since it is much less easy to capture the birds when they are flying, especially if they happen to be in a large room or in the hayloft. Chimney Swifts are much easier to work with when, as above, their nests are within reach of the net. They will tolerate much more noise than the swallows, and remain clinging to the wall considerably longer after the light is flashed on them. If there are eggs in the nest, only one bird will be found on it. When the swifts have newly hatched young, both parents brood them during the night. Finally, if the young are well grown, the parents roost clinging to the wall, often one next to the other with their bodies touching. In the last two cases, then, the bander may often catch both adults at one time.

Such convenient opportunities for banding swallows and swifts are generally the exception rather than the rule. When the birds are nesting on the ground level, or elsewhere in the barn, but within reach of the net, they may be taken easily but in limited numbers. There are almost always many more birds occupying the hayloft, six or more pairs of swallows and an occasional pair of swifts being not uncommon in my experience. At Beaver Kill, New York, where I do most of my night work, the barns usually have two

gable ends with a window below each gable. If each of these windows has panes missing, and if the barn door generally stands open, there are sure to be many swallows nesting up in the hayloft. In addition to bands and pliers, the equipment consists of three or five-celled flashlights or headlights; light, long-handled nets with deep sacs (insect nets are perfect); several gathering cages; a light pole about twenty feet long; and a gasoline lamp.

During the day, the group visits some of the local barns and selects one or two which have a good number of swallows nesting in them. Having chosen our barns we explain to the owners what we expect to do and request his permission and cooperation. We then enter the barn and explore it thoroughly, familiarizing ourselves with its entire lay-out. From the level of the hay in the hayloft to the gable-end windows is a climb of twenty feet or more. In many barns the farmer has nailed crossboards to two adjacent vertical beams beneath the window, thus forming a ladder; when this is not the case we nail the boards on. Before leaving, we fasten a large burlap or feed bag to the top edge of every window, using a carpet tack on each end and one in the middle. Then the bag is rolled up from the bottom and the roll is tacked lightly above the window.

After dark, the crew cautiously slips into the barn and the men proceed to close all doors and all but the two windows at the gable ends. Next, two people each equip themselves with a net and flashlight. The flashlight is slipped face up between the belt and trousers on the left hip if the bander wields the net with his right hand, or on the right hip if the left hand is to be used. The net is carried on the other hip, or its sac may be gripped in the teeth. Headlights are vastly superior to ordinary flashlights, for they not only leave both hands free, but also throw a powerful beam on every object toward which you turn your head. A gathering cage fastened to your trousers' belt completes the preparations. These two people then climb up to their respective windows and, removing the tack, allow the bags to unroll and cover them. There are two important reasons for doing this. In the first place, the birds fly in and out these windows all day long and they naturally attempt to use them as a means of escape after dark. Furthermore, each window stands out as a light place in the dark barn, and the swallows are attracted to them just as they are to the lights; thus, even a strange bird could easily find his way out. The lower sash is left open a few inches from the bottom so that the bander may hook his arm over the sill and hang on. Should the barn have a platform between the floor of the loft and the roof, the other men mount this, taking with them a net, a cage, lights, and the long pole.

Everything is done quietly until when all are ready, the lights are flashed on. The men at the windows have their lights on, and the surprised birds, which are soon fluttering about all over the place, are attracted to the lights and even occasionally alight on their would-be captors. The swallows (and the swifts, if there are any in the barn) employ a slow, fluttering, hovering type of flight and never fly into anything as long as the lights are kept on. I have found that Chimney Swifts, which are less easily captured in a hayloft than are Barn Swallows, can be lured to the bander if he will make short squeaking noises with his lips, squeaks like those which field students use to coax shy birds out of hiding. When a bird comes near enough it is netted. Should two or more come along, several turns of the net's sac on the handle will hold those already captured until the others are within reach. This technique was more fully outlined in a previous paper (*Bird-Banding* 13 (1): 31, 1942). Captured birds are placed in the gathering cages when convenient or necessary.

Meanwhile, the men on the platform are not idle either, for birds are also attracted to their lights. One of them nets the birds while the other, with the long pole, prods those which have found perches for themselves. As long as the birds are kept flying, they will sooner or later be attracted to the lights.

When the last bird has been captured, we climb down from our stations and band them in the barn by the light of the gasoline lamp. The birds are released as banded and have little trouble in finding perches. After reopening the doors and windows, we head for the next barn. Although we never make any "big hauls"—twenty to twenty-five birds being considered a good catch for the night—we always have an enjoyable time. The bird-bander who has never done this kind of work has been missing a unique experience.

140–19 Beech Avenue, Flushing, New York.

GENERAL NOTES

Unidentified Bands.—In November 1943 Dr. Robert Cushman Murphy received the leg of a gull found as a well-macerated skeleton on a beach on Marthas Vineyard, Massachusetts. Three rather battered bands were affixed to the leg in the following sequence:

Distal band.....	Red celluloid on copper	Not numbered
Middle band.....	Aluminum	66561 MS
Proximal band.....	Tinned iron (very rusty)	21868 ME

The writer's investigations in connection with the color-banded Herring Gull project have not disclosed such a band combination, and inquiries of Mr. F. C. Lincoln and other ornithologists have failed to provide any clue to the identity

of the bands.

The record is here published in the hope that some reader may recognize the combination and identify the specimen.—Eustace H. Poor, 112 Park Avenue, Yonkers 3, New York.

Green-winged Teal, Banded in California, Taken in Labrador.—While at Henley Harbour, Labrador, on June 29, 1943, I was given a bird band, number 40-520418, taken from a Green-winged Teal killed there on June 10, 1943, by Lindsay Ploughman. This teal was originally banded at Tulare, California, on September 26, 1940, by Gordon True. There are few records of birds crossing from the Pacific to the Atlantic Flyway, and this one indicates the bird may have been nesting in southern Labrador. Henley Harbour is at the entrance of Chateau Bay, on the north side of Belle Isle Strait.—Harold S. Peters, U. S. Fish and Wildlife Service, Charleston, South Carolina.

A Kingbird Shares its Nesting Tree.—In a previous note (*Bird-Banding*, 13 : 119–120, 1942), I related how a pair of Kingbirds (*Tyrannus tyrannnus*) successfully nested in the same tree with a pair of Baltimore Orioles (*Icterus galbula*). Since it was clear that the Orioles were first to build in the tree, this question was posed: would a pair of Kingbirds permit another species to share *its* nesting tree?

This question was answered two years later, for on July 3, 1943 I discovered a pair of Least Flycatchers (*Empidonax minimus*), Robins (*Turdus m. migratorius*) and Kingbirds all nesting in the same apple tree. This was at Beaver Kill, N. Y., about four air-line miles from place where the question first presented itself. The Least Flycatchers had three young about ten days old, while the Kingbirds' two nestlings were from six to seven days old. Their nests were approximately seventeen feet apart. Not only did the Robins have three rather fresh eggs (they were still unhatched ten days later), but their nest was only nine feet from the Kingbirds', and between them and the Least Flycatchers. Here, then, was an instance in which the Kingbird permitted a larger although less aggressive bird to share its nesting tree.

All three species seemed to get along well together. The only unpleasantness I ever witnessed occurred when I climbed the tree to band the young Kingbirds. One of the Robins, which was anxiously scolding and hopping about in the tree, approached to within four feet of the Kingbirds' nest. Thereupon, one of its owners dashed down at the Robin and pecked it. Though the Robin continued to scold, it stayed at a respectable distance from the Kingbirds' nest.

Unfortunately, something carried off the Robins' eggs a few days before they would have hatched. However, both the Kingbirds and Least Flycatchers raised their young successfully.

What I cannot quite understand is why these three birds crowded themselves into the one tree when there was an ample number of vacant trees nearby. It was a typical uncared-for apple tree with sprawling foliage. I should say that it was thirty feet high, with a trunk about twenty inches in diameter. Since there are several horizontal branches on the tree, Kingbirds have nested in it for the past three or more years, on or near the same branch. Perhaps one or both of these birds had used the tree before.

Less than half a mile from this tree, I discovered a somewhat similar situation in 1937. In a scrubby little neglected apple tree on the edge of a dusty dirt road were a pair of nesting Chipping Sparrows (*Spizella passerina*) and Cedar Waxwings (*Bombycilla cedrorum*). The former had young about one week old, while the latter had eggs. The tree was so small, it was not taller than twelve feet, that the birds' nests were within five feet of each other. The young sparrows left their nest just before I had to leave, thus being prevented from learning the fate of the Waxwings' eggs.—Richard B. Fischer, 140–19 Beech Avenue, Flushing, New York.

More Repeats on Banded English Sparrows.—Between July 7 and December 10, 1943, a total of 233 English Sparrows (*Passer domesticus*) was trapped in two government sparrow traps located on the roof of McGilvrey Hall on the campus of Kent State University. (The traps were not in operation between September 10–22 inclusive.) Eighteen birds were taken as repeats. Twelve were captured twice, two three times, and four individuals were trapped four, six, nine, and fourteen times respectively. Three birds were taken twice in a single day. Total repeats number 42 not counting those captured more than once per day. Following are the records:

Band No.	*Sex*	*Dates of Capture*
37-114658	Im. Male	7/9; 11/4
37-114654	Immature	7/11; 7/13
39-231019	Im. Female	7/13; 8/9
40-195853	Im. Male	7/23; 10/26
40-195893	Im. Male	8/4; 9/7
38-67410	Immature	8/7; 8/8; 8/15
38-67419	Im. Male	8/7; 9/30; 10/4; 10/25
38-67424	Im. Female	8/8; 8/15
38-67429	Female	8/8; 8/10; 8/15
38-67435	Im. Female?	8/9; 8/10
39-162313	Im. Female?	8/18; 8/20
39-162325	Im. Female	8/20; 8/21; 8/23 A.M. and P.M.; 8/24; 8/26; 8/27; 9/1; 9/7
39-162328	Im. Female?	8/21; 8/22; 8/23 A.M. and P.M.; 8/24; 8/26
39-162337	Im. Female?	8/23; 9/4
39-162347	Immature	8/26; 9/4
39-162349	Immature	8/26; 8/30
39-162353	Female	8/30; 9/7
39-162359	Im. Male	8/31; 9/3 A.M. and P.M.; 10/5; 10/18; 10/25; 10/26; 10/29; 10/31; 11/1; 11/2; 11/3; 11/5; 11/9

These records, like those published earlier (*Bird-Banding* 13 (3): 121), indicate that these birds belong to a rather local population during the summer and early fall months. The traps were visited twice daily. The number of sparrows captured each time they were found in the traps averaged 3.7. In most instances they were all in the same trap, and numbered as many as 13 at one time. From July until mid-October many individuals, chiefly immature birds, were captured almost daily. In the late fall only a few individuals or single birds were taken at a time, and at intervals of several days or a week or more. During November only three birds were captured, and in the month of December but a single individual was successfully trapped. In the late fall and early winter many of the sparrows became wary of the traps. While they fed in large numbers on the bait in front of the traps, most of the birds that did enter knew how to escape through the funnel openings. This was observed by the operator on many occasions as he approached the traps. In order to prevent this from recurring, the second funnel openings were made so narrow that a sparrow could squeeze into the second compartment, but in all likelihood could not make its way back out again. After that was done, no birds entered the second compartment, as attested by the fact that the bait was never touched, even when it was exhausted elsewhere, although the sparrows continued to come to the station and enter the first compartments from which all but one bird escaped.

While repeats have been frequent, very few returns and recoveries have been

recorded thus far after three summers of banding the English or House Sparrow. These will be reported later after more data have been secured.—RALPH W. DEXTER, Kent State University, Kent, Ohio.

An Eastern Goldfinch Return.—I began bird-banding in early summer in the year 1924. No banding was done from May 19, 1925 to July 31, 1927, when I was away and not in a suitable place to operate a station. With the exception of winter of 1927–28, my station has always been here near McMillan, Luce County, Michigan, where I live. During the winter of 1927–28 I was in the western part of this county. Up to this date, January 23, 1944, I have banded 37 Eastern Goldfinches (*Spinus tristis tristis* (Linn.)).

From these birds, I have had only one return. This is an adult male, banded July 12, 1941, and was retaken on August 13, 1942. Both times it was trapped in the same trap at the same place and with water for bait.

The first goldfinches that I banded were four young that had just left the nest on August 19, 1928. Of the goldfinches that I have banded, eight would be classed as nestlings which were taken from the nest or caught by hand soon after they had left the nest. All of the others were trapped, these are: four young, thirteen females and twelve males.

The months in which I have banded goldfinches are May, June, July, August, September, and October. The year 1942 was greatest in number banded with three immatures, three females and three males. The greatest single month's banding was September 1942 when I banded three immatures, two females and two males. In all time, the month of August holds the lead with eight nestlings, three females and two males banded. Next to this was July with seven males and two females.

Of the birds trapped, a few have been taken with nesting material such as wool for bait; but by far the majority have been trapped with water.—OSCAR MCKINLEY BRYENS, R. F. D. No. 1, McMillan, Luce County, Michigan.

Five Slate-colored Junco Returns Captured in One Day at Ardmore, Pa., on November 11, 1943.—Two returned one year after banding; 2 returned one and two years after banding; 1 returned one, two and three years after banding.

The three-year return, 40-95430, when making its first return on October 30, 1941, was observed in a trap, with a Sharp-shinned Hawk standing on top of the trap, making a determined attempt to attack the bird. All efforts to drive the hawk off failed, so it became necessary to dispose of the hawk to save the bird's life.

From this junco's return record, it appears it was not affected by its harrowing experience, which nearly cost it its life, since it did not prevent it from returning the following year and again a year later, to the place where it had a narrow escape from death.

Is it possible that some birds are not as much disturbed as we imagine by the attempted attacks of hawks? Or possibly some birds do not have as good memories as they are said to have.—HORACE GROSKIN, 210 Glenn Road, Ardmore, Pennsylvania.

Junco Return at Ardmore, Pa., at Least 6½ Years Old.—No. 38-60179. Banded December 24, 1937.

1st return November 4, 1939
2nd return November 18, 1940
3rd return November 13, 1941
4th return November 15, 1942
5th return November 14, 1943

This bird was never captured at Ardmore in the spring migration, nor did it ever enter the traps during any year as a repeat. Its schedule through the

Ardmore, Pa., station during the past five years in November is interesting.—HORACE GROSKIN, 210 Glenn Road, Ardmore, Pennsylvania.

White-throated Sparrow Return at Ardmore, Pa., at Least 6½ Years Old.—No. 39-128738, Adult ♂, banded December 24, 1938.

1st return April 26, 1940
2nd return November 11, 1940
3rd return March 7, 1942
4th return October 31, 1942
5th return November 27, 1943

The White-throat is a migratory bird at Ardmore, Pa., with a few remaining to winter. It does not breed in our locality.—HORACE GROSKIN, 210 Glenn Road, Ardmore, Pennsylvania.

Some Alaska Returns.—During the spring and summer of 1942 I banded 133 birds including 68 Gambel Sparrows, two Fox Sparrows, and one Slate-colored junco. Of this number five Gambel Sparrows, one Fox Sparrow, and the single junco returned in 1943, giving return percentages respectively of 7.3, 50, and 100. The Junco nested near the traps, as some of the others may also have done, for of some I have repeat records extending through the summer except for brief times when the traps were closed.

One Gambel Sparrow, 40-168545, has a record indicating that it may have migrated beyond this point stopping in both spring and fall. This bird was banded as an adult on May 22, 1942, and repeated six times through May 26. My traps were idle from that date until July 7, but this bird was not retaken until August 19 on which date it repeated three times. I next took it as a return on May 24, 1943; one year and two days after banding. It repeated once on May 26. My traps were idle from July 19 to August 7. Thereafter this bird repeated twice on August 22 and once the next day.—HENRY C. KYLLINGSTAD, Mountain Village (Lower Yukon), Alaska.

RECENT LITERATURE

Reviews by Donald S. Farner

BANDING STUDIES AND MIGRATION

1. The Problem of Partial Migration. David Lack. 1943. *British Birds*, 37 (7) : 120–130. Returns from birds banded in England and Scotland are used in studying the problem of partial migration. In the case of the British Song Thrush, *Turdus ericetorum ericetorum* Turton, returns show that the birds either winter close to the place where they were banded as nestlings or migrate for considerable distances. Furthermore there is a sharp separation of the westward migration to Ireland from the migration southward to France, Spain, and Portugal. There is no migration for the purpose of wintering in southern England. A large portion of the thrushes of southern England spend the winter there, whereas an equally large portion of the thrushes of northern England are migratory. Eighty-four per cent of the thrushes recovered in France, Spain, and Portugal were first year birds whereas only 41% of those recovered in Ireland were of this group.

The British Starlings, *Sturnus vulgaris vulgaris* L., are mostly resident. A small number, especially from northern Britain, migrate westward to Ireland,

there is a single record of a recovery of a British bird in France. On the other hand more Pied Wagtails, *Motacilla alba yarrellii* Gould, migrate south to France, Spain, and Portugal than remain in the area where they were banded. The migration of the British Blackbirds, *Turdus merula merula* L., is similar to that of the Song Thrush except that very few migrate to France, Spain, and Portugal. It appears that the principal migration is westward to western England and Ireland. Information on the robin, *Erithacus rubecula melophilus* Hart., is fragmentary although it is obvious that very few migrate south to France. Most of the migratory birds are females.

Lapwings, *Vanellus vanellus* (L.), either winter close to the place where they were banded or move westward to Ireland with a few going to southwestern Wales, Cornwall, and southwestern Devon, or move southward to France, Spain, and Portugal. None winter in southeastern and southern England. Most Curlews, *Numenius arquata arquata* (L.), migrate to Ireland although considerable numbers are resident. There is a single record of a recovery in Spain. Most of the Woodcocks, *Scolopax rusticola* (L.), are resident although some migrate west to Ireland and a few southward to France and Spain.

Among the Black-headed Gulls, *Larus ridibundus ridibundus* L., there is no clear cut difference between residents and migrants since recoveries occur at varying distances from the point of banding. Furthermore there is no tendency to divide into flights westward to Ireland and southward to France, Spain, and Africa since there are also winter recoveries from southern and southeastern England. There is a greater tendency towards migration among the young.

Cormorants, *Phalacrocorax carbo carbo* L., which nest in Scotland either remain there during the winter or disperse to Ireland, southern England, France, and Spain.

2. The Dispersal of 21,414 Chimney Swifts Banded at Baton Rouge, Louisiana, with Notes on Probable Migration Routes. George H. Lowery, Jr. 1943. *Proceedings of the Louisiana Academy of Sciences*, 7 : 56–74. Of 21,414 Chimney Swifts, *Chaetura pelagica* (L.), banded in Baton Rouge, 340 were recovered at Baton Rouge after a lapse of at least one season; 126 were recovered at distances varying from 15 to 1,900 miles. Recoveries indicate there are two flyways involved in the North American continental migrations both converging in the Lower Mississippi Valley. One proceeds southward down the Mississippi Valley and the other southwestward from eastern Canada, New England, New York, and Virginia, down the Alleghenies and across the Lower Mississippi River Valley. Recoveries indicate further that there is considerable random movement in the fall in Louisiana and adjacent areas prior to departure southward. The author concludes that the principal migratory route southward from the United States is the trans-Gulf route directly south from Louisiana. The Texas-West Gulf Coast is ruled out because of the scarcity of swifts in Texas during the migratory seasons. The same is true for the Florida-Antilles route although there is evidence that a few may return northward via this route arriving in Florida in mid-April; those arriving in mid-March are assumed to have migrated eastward from Louisiana following the trans-Gulf crossing.

3. Ring-billed Gulls of the Great Lakes. Frederick E. Ludwig. 1943. *The Wilson Bulletin*, 55 (4) : 234–244. Ring-billed Gulls, *Larus delawarensis* Ord, apparently disappeared as breeding birds in the Middle West about 1906 and reappeared about 1926. This paper is based on the returns of birds banded in breeding colonies in Michigan on Lake Huron and on upper Lake Michigan, and in Ontario (chiefly North Channel and Georgian Bay). From 1936 through 1941 18,259 birds were banded; there were 496 returns (2.7%). This is compared with 19,564 banded Herring Gulls, *Larus argentatus smithsonianus* Coues,

which gave 739 returns (3.8%). Winter returns indicate that a few birds spend the winter in the Great Lakes area whereas the majority of adults and immatures spend this period in the Gulf area particularly in Florida. Summer returns indicate that some of the immature birds spend the first summer in the South whereas others return to the Great Lakes area. "Four returns from North Carolina, made during the breeding season of the third year after banding, point to the possibility of a nesting colony of Ring-billed Gulls on the North Carolina coast." Fall and spring returns point to migratory routes on the Ohio and Mississippi rivers and also along the St. Lawrence and Hudson rivers and down the Atlantic coast. Mortality appears to be highest during the first six months of life and nearly as high during the first calendar year following banding. This is an important paper; it is the result of an outstanding banding project.

ECOLOGY AND POPULATION STUDIES

4. Population Turnover on a Wisconsin Pheasant Refuge. Aldo Leopold, Theodore M. Sperry, William S. Feeney, and John A. Catenhusen. 1943. *The Journal of Wildlife Management*, 7 (4) : 383–394. Censuses and bandings of a sample population were made for five successive years with the protected Ring-necked Pheasant (*Phasianus colchicus* (L.)) population of the University of Wisconsin Arboretum. This tract consists of 500 acres of marsh, 60 acres of oak-hickory timber, and 40 acres of old fields. Census figures were as follows: 1937–38, 260 (of which 127 were removed); 1938–39, 214; 1939–40, 340; 1940–41, 299; and 1941–42, 317. The number of different birds trapped for these seasons were 22, 145, 178, 162, and 145 respectively. Correcting for the "untrapped residue" and averaging the results of the five seasons the authors' data show that the trapped population for the average year has a composition ratio of 100 newly banded: 30 banded one year previously: 9 banded two years previously: 1.8 banded three years previously: none banded four years previously. "The uniformity of the shrinkage rate (70%, 70%, 80%) in the series has special significance. The numerical base for these shrinkages of course decreases to the right, hence the terminal figure carries the least weight. The identity of the first two figures suggests that once a pheasant reaches his first winter, the experience which accrues from age ceases to have any further survival value." In 1940–41 and 1941–42, 183 birds were trapped and banded at the Fish Hatchery 1¼ miles south of the Arboretum. The city of Madison and the lakes prevent immigration and emigration in directions other than south. None of the birds banded at the Fish Hatchery were recovered in the Arboretum and no Arboretum-banded birds were recovered at the Fish Hatchery. Only two Arboretum-banded birds were taken by hunters, both within one-half mile of the Arboretum boundary. Therefore it appears that the data accumulated in this study apply strictly to an independent population although the movements of the birds of the year are not known. A very interesting study.

5. Census of a Colony of Caspian Terns. Alden H. Miller. 1943. *The Condor*, 45 (6) : 220–225. This nesting colony of Caspian Terns, *Hydroprogne caspia imperator* Coues, which is located in the marshes of the south arm of San Francisco Bay has increased from seven occupied nests in 1922 (two in 1923) to 378 in 1943. It is estimated that there were 400 nesting pairs in 1943 with a grand total of 816 young and eggs (May 21). Attention was given to the color phases of the newly hatched young. Of 110 given careful observation, 62 were of the dark type, 40 of the light type, and eight of the intermediate type. On some occasions two or three types were found in the same nest. The author suggests that these types are determined by a relatively small number of hereditary factors and that the genes for the determination of the two principal types are of high frequency.

6. The Prairie Falcon in Colorado. Harold M. Webster, Jr. 1943. *The American Falconer*, 1 (4) : 10–13. The author estimates the total nesting population of the Prairie Falcon, *Falco mexicanus* Schlegel, to be about 500 pairs. This is based on his personal observation in "the past four or five years" of 135 eyries in three small sections of the State. Included in these observations are Colorado Springs and El Paso County, Denver and vicinity, and the chalk cliffs south of Cheyenne, Wyoming. In addition there are reports of 80 pairs which were not observed by the author. He believes that the population of this species in Colorado is maintaining itself although in general Buteos are decreasing. It is suggested that the Colorado falcons migrate little if at all. The change in diet from rodents to birds at the time of hatching of the Prairie Falcon eggs is doubtlessly due to the fact that the rodents which, during the mating season in the spring are conspicuous and easily taken, become less conspicuous whereas young passerines become abundant and easily fall prey to the falcons.

7. The Canada Spruce Grouse in Wisconsin. Walter E. Scott. 1943 *The Passenger Pigeon*, 5 (3) : 61–72. The present Wisconsin range of the Spruce Grouse, *Canachites canadensis canace* (L.), includes local spruce and balsam swamp areas in ten counties in the northern part of the State. Range evacuated since 1900 probably included parts of seven additional counties. The original southern limit of the range of this species was probably roughly coincident with a line passing from central Marinette County to Central Polk County. The number of birds reported for the entire State in 1941 was 227. The total population is estimated as no less than 516 and no more than 820.

LIFE HISTORY

8. The Kuaka or Diving Petrel, *Pelecanoides urinatrix* (Gmelin). L. E. Richdale. 1943. *The Emu*, 43 (1) : 24–48 and 43 (2) : 97–107. The observations recorded in this paper were made in the course of five trips aggregating 21 weeks to Whero, a small island off the northwest corner of Stuart Island, New Zealand. Following the departure of the chicks in January there is a period of at least four months when the birds are at sea. By August they are again spending nights on Whero. At this time both solitary and paired birds were observed. In August the birds were always on the ground at night whereas in January and February they were always in their burrows. The author feels that the staying outside of the burrows at night has something to do with courtship. Of 39 nests observed in 1940–41 only seven were occupied by petrels during the following nesting seasons. Of 18 pairs banded in 1940–41 only three were found again together; the other 15 pairs were never found again in subsequent seasons.

"The majority of the Kuaka burrows on Whero are in the shallow soil around the edge of the island where it is dominated by Poa tussock. There are a few here and there in the sedge and I found one near the tent in the *Muehlenbeckia* area." "Those inhabiting the sedge were frequently just under and among the roots, or not in a burrow at all, but had employed the overhanging leaves as a roof to the nest." The usual length of the burrow is about 18 inches.

The earliest hatchings in 1941–42 were on November 4; 81% were hatched between November 14 and December 3. The incubation period is estimated to be within a day or two of eight weeks. Eggs varied in size from 35 x 27¼ mm. to 42 x 29¾ mm. and in weight from 14 to 18¼ grams.

It appears that parents alternate in incubating and that the change is made nightly. Pairs of non-nesting adults of unknown age occupy burrows although they seldom remain in them during the day. Criteria for estimating the age of the chicks are given. Dark secondary down appears about the 7th day. The quills of the longest primaries are 0.5 mm. on the 19th, 3 mm. on the 21st, and 9 mm. on the 25th. Tail quills appear on the 26th; on the 31st the quill of the

longest primary is 25 mm. long; etc. Only once was an adult bird found with its chick during the day. The principal enemy of the chicks as well as the adults is the skua. The mortality among the chicks during the two seasons was remarkably low (one chick in 90 under observation).

The method of feeding was studied by lighting the burrow at night and constructing an extra opening through which observations could be made. "The parent, after having already, with a barely perceptible cough, brought the food up part of the way, opens its mandibles, waits for the chick to put the point of its bill into its mouth, and then squirts forth a red cream, thick and ribbon-like, as if from a tube of tooth paste. The chick immediately takes this with point of its bill but evidently finds the act difficult for it pushes the bill crossways so that the ribbon-like material is taken side on but with that portion of the bill close to the tip. At the same time the mandibles are vibrated rapidly to make room for the whole pieces, which appeared to be about one inch long." Feeding always takes place soon after the parent arrives. Many of the nights the chick is fed by both parents and occasionally by neither. The maximum amount of food received is about 15 grams per night from the 21st to the 40th day. Thereafter the amount received decreases until the chick leaves the nest at about the 40th day. The peak weight of the chicks occurs at 41st to 44th day. The weights of the chicks on the *8th day before departure* averaged 148 grams; the average weight on the day of departure was 125 grams. The mean weight of 85 breeding adults was 124 grams. Wing length in the chicks increased steadily from a mean 108.8 mm. on the *9th and 10th days before departure* to a mean 120.7 mm. on the last and next to the last days. In 1941, 85% of the chicks left the burrows between January 7 and 31. In 1942, 82% left between January 7 and 26. The majority of them departed at about the time of the loss of the down. The paper contains an abundance of important data which cannot be included in a review. It is a significant life history study.

9. Nesting Habits of the Tree-Martin. M. S. R. Sharland. 1943. *The Emu*, 43 (2) : 126–130. The Tree-Martin, *Hylochelidon nigricans* (Vieill.), is essentially a bush bird although it occasionally nests about dwellings in such places as ventilators. However this species has not adapted itself to these conditions as readily as the Welcome Swallow, *Hirundo neoxena* Gould, and the Fairy Martin, *Hylochelidon ariel* Gould.

10. Some Observations on the Common Pochard. E. O. Höhn. 1943. *British Birds*, (6) : 102–107. Observations were made on the Common Pochard, (*Nyroca ferina* (L.)), during 1936 and 1937. Courtship was observed to occur from as early as March 16 to as late as May 17. The males exhibit three postures during courtship: (1) forward posture in which the neck is stretched stiffly along the surface of the water, (2) backward posture in which the head is thrown backward and brought forward rapidly, and (3) dipping posture in which the head is raised and lowered jerkily. During these movements the bird often swims about rapidly and eratically. A soft call, "quee-wrek," is frequently given. Among the postures observed among the females were (1) swimming about with neck held stiffly, jerking the head up and down, (2) pecking the water while swimming about eratically, and (3) a posture apparently inviting copulation. Two calls, an explosive "pwook" and an intensification of the alarm note "graa," were observed among the females during courtship. Courtship was initiated by the drakes in all cases. Both courtship and copulation occur before pair formation while the birds are associated in small groups. Males were seen in courtship performances when there were no females present. After hatching family group are maintained for four weeks. Males left the breeding area during June, females in July, and the young in August and early September.

REPRODUCTION

11. Nest-Site Selection by Birds. Caroline and Desmond Nethersole-Thompson. 1943. *British Birds*, 37 (6) : 108–113. This is the concluding part of this valuable compilation of information on nest-site selection by birds. Because of the already condensed nature of the notes it is not possible to summarize adequately here the information that they contain. Readers interested in this type of material will find this compilation very useful. Seventy-six species are included in the concluding section.

12. Plover Egg Clutches. M. S. R. Sharland. 1943. *The Emu*, 43 (2) : 95–96. This paper records the observation of A. W. Swindells of a Spur-winged Plover (*Lobibyx novae-hollandiae* (Stephens)) clutch with seven eggs. There were two females which sat on the nest. A single male guarded nearby.

13. A Study of Wild and Hand Reared Killdeers. Emma Davis. 1943. *The Wilson Bulletin*, 55 (4) : 223–233. Fifteen Killdeer (*Oxyechus vociferus* (L)) nests were studied in 1931 in the Finger Lakes District of New York. Both sexes shared in incubation and the care of the young. No elaborate ceremony was observed at the change over of incubating birds. Care of the young was restricted to brooding, guarding against enemies, and warning of danger. The adults were never observed to feed the young. In 1932 five young Killdeer were reared from artificially incubated eggs. In 1933 two captive birds mated and produced three young. In this pair the male constructed the nest, shared "at least equally" in the incubation, and when the young were several days old assumed almost complete care of the brood.

PHYSIOLOGY

14. Hormonal Determination of Adult Characters and Sex Behavior in Herring Gulls (*Larus argentatus smithsonianus* Coues). Willis Robert Boss. 1943. *The Journal of Experimental Zoology*, 94 (2) : 181–210. In this interesting series of experiments it was possible to demonstrate that the male sex hormone is responsible for the assumption of the adult plumage in both sexes of the Herring Gull. Continuous injections of testosterone proprionate beginning with the third day of incubation and continuing for 24 months induced the premature development of adult bill color and plumage at the age of one year as compared to the normal period of development of three years. When injections of the testosterone were discontinued when the males were in immature plumage they reverted to juveniles. When both sexes were treated with testosterone injections starting at 53 days and continuing for 669 days there was a premature assumption adult plumage and voice. Accompanying the premature development of adult plumage in the male was also that of aggressiveness, territorial defense, and nest-building. The same occurred in castrated males injected with testosterone proprionate. Injection of gynogenic hormones (stilbesterol and estradiol proprionate) had no effect on the first year juvenile characteristics of either sex. The sexual weight difference is obviously genetic since it was not influenced by any kind of injection. Gonadotropic hormones did not effect the plumage of immature and juvenile birds indicating that the gonads at this time were not sufficiently developed to be influenced by pituitary secretion. Thyroxin also had no effect on the plumage except to increase its luster. Of particular significance in these experiments is the demonstration of the apparent dependence of both sexes on the *male sex hormone* for the development of the adult plumage, etc. Of further importance is the demonstration of the apparent refractory condition of the gonads to pituitary stimulation during the immature and juvenile stages. A very significant paper.

15. Metabolism of the English Sparrow. Daniel P. Quirring and Paul H. Bade. 1943. *Growth*, 7 (3) : 309–315. Basal metabolic rate was computed for fifteen males and fifteen female English Sparrows (*Passer domesticus domesticus* L). from measurements of oxygen uptake and carbon dioxide release. Measurements were made from 2:00 P.M. to 4:30 P.M. after the birds had been allowed 30 to 40 minutes for adjustment to the apparatus. Mean oxygen uptake for the males was found to be 2,053 cc. (Standard Deviation, 462 cc.) per 24 hours; for the females, 1,911 cc. (S. D., 435 cc.). The carbon dioxide release for the males was 1,906 cc. (S. D., 334 cc.); for the females, 1,625 cc. (S. D., 351 cc.). The respiratory quotient for the males was 0.860 and for the females, 0.854. Metabolic rate for the males was computed to be 10.90 Calories per 24 hours; for the females, 9.38 Calories per 24 hours. The authors regard this difference as statistically significant. The caloric output per square centimeter of body surface for the males was computed to be 0.0304 and that of the females, 0.0261. This difference is also regarded as significant. The correlation between basal metabolic rate and body surface is +0.416; between basal metabolic rate and body weight, +0.321. There is a negative correlation between basal metabolic rate and the weight of the thyroid gland (−0.321).

16. Age Determination in Juvenal Bob-white Quail. George A. Petrides and Ralph B. Nestler. 1943. *The American Midland Naturalist*, 30 (3) : 774–782. In order to establish criteria for age determination in Bob-white Quail, *Colinus virginianus* (L.), tabulations were made of the ages at which captivity-raised birds dropped their juvenal remiges and the rates at which the post-juvenal replacement primaries grew. Post-juvenal wing molts were observed to begin on the 28th day and ended at 146 to 154 days. Although there is considerable variation in individual cases it appears that the tabulation should prove to be useful. The tabulations are based on the daily measurements of two captive birds and bi-weekly checks on a group of 20 to 35 captive birds. Consideration should be given to the fact that feeding of scientifically balanced diets may have affected the course of the molts.

17. Organ and Gland Weights of the English Sparrow. Daniel P. Quirring and Paul H. Bade. 1943. *Growth*, 7 (3) : 299–307. Body weight as well as weights of various organs and glands were obtained from 57 males and 44 female English Sparrows (*Passer domesticus domesticus* L.). Body weights were found to range from 15.20 to 29.80 grams. The mean for the males was 24.81 ± 0.35 grams; for the females, 23.41 ± 0.47 grams. Data on the weights of the brain, thyroid gland, adrenal glands, eyes, heart, digestive tract, kidney, liver, lung, pancreas, spleen, and gonads are statistically analyzed and tabulated. Body weights as well as the weights of the brain and liver were found to be significantly higher in the males. Eye weights were significantly higher among the females. Correlations between the weights of organs and body weights were low except in the cases of the heart (+0.805) and the liver (+0.451).

FOOD HABITS

18. Seasonal Insect Food of the Western Chipping Sparrow. George F. Knowlton and Stephen L. Wood. 1943. *The American Midland Naturalist*, 30 (3) : 783–785. This paper gives a detailed analysis of the insect food contained in 283 stomachs of the Western Chipping Sparrow, *Spizella passerina arizonae* Coues, collected in Utah during the nine years from 1934 to 1942 inclusive. In total items Homoptera constituted nearly two-thirds of all insects in the stomachs. Hemiptera and Coleoptera were next in total numbers taken by the birds.

BEHAVIOR

19. Contests of Double-crested Cormorants for Perching Sites. George A. Bartholomew, Jr. 1943. *The Condor*, 45 (5) : 186–195.

Observations were made on the competition of non-breeding cormorants, *Phalacrocorax auritus* (Lesson), for roosts on a group of pilings at Berkeley, California. It was concluded that an absolute "peck-right" does not exist. Rather there is the more flexible "peck-dominance". The winners of contests for roosts are determined largely by circumstances such as wind direction and velocity, direction of attack, position of defending bird, etc. Frequently a dispossessed bird will regain his roost within a short time. Attacking birds are as aggressive as the defenders. Contests for roosts are purely psychological, involving threats, postures, and calls only. A very interesting paper.

HEREDITY, VARIATION, AND EVOLUTION

20. The Two Phases of *Stercorarius parasiticus* (L.). H. N. Southern, 1943. *The Ibis*, 85 : 443–486. This interesting discussion is based primarily on papers in the literature which record data on the ratio of dark and light phases of breeding colonies of *Stercorarius parasiticus* (L.). Among the Skuas melanics are rare in *S. longicaudus* Vieillot, 5–10% in *S. pomarinus* (Temminck), and 0–95% in *S. parasiticus*. The breeding range of *parasiticus* is circumpolar and almost coincident with the range of the tundra. Its greatest population concentrations are in the areas of the North Pacific and the North Atlantic. There appears to be a definitely larger percentage of pale birds among the more northern colonies. Isolines connecting areas of the same proportions of pale to dark phases are approximately concentric about the Pole. The 25% light-phase line passes through southern Alaska, north central Canada, south of Greenland, through Iceland and southern Scandinavia. The 50% light-phase isoline passes through central Alaska, northern Canada, south of Greenland, and through northern Scandinavia. The 75% light-phase isoline passes along the north coast of Alaska and Canada, through central Greenland, and along the north coast of Scandinavia. The colonies on the British Isles constitute an exception to this scheme. There is no apparent basis for selection of the pale phase in the northern colonies since there is no correlation between its occurrence and temperature, or relative humidity. Intra-group clines occur only in Iceland. The author suggests that selection is on a physiological basis with no direct relation to the color phases as such. There is a very interesting discussion on polymorphism and polymorphic clines. This discussion as well as the material on clines in Skuas is highly recommended.

GEOGRAPHICAL DISTRIBUTION

21. The Avian Genus *Zosterops* in Siam, with Description of one New Race. H. G. Deignan. 1943. *Zoologica*, 28 (4) : 201–202. The following White-eyes are now known to occur in Siam: *Zosterops erythropleura* Swinhoe, *Z. japonica simplex* Swinhoe, *Z. palpebrosa mesoxantha* Salvadori, *Z. palpebrosa joannae* La Touche, *Z. palpebrosa williamsoni* Robinson and Kloss, and *Z. atricapilla wetmorei* Deignan (subsp. nov.). *Z. palpebrosa siamensis* Blyth does not occur in Siam.

22. Birds of the Kings Canyon National Park Area. Joseph S. Dixon. 1943. *The Condor*, 45 (6) : 205–219. An annotated list of the 127 species and subspecies thus far recorded.

23. Birds of Warnboro Sound, Western Australia. V. N. Serventy and S. R. White. 1943. *The Emu*, 43 (2) : 81–95. This paper contains lists of the avifaunae of Penguin Island, Shag Island, Seal Island, Bird Island, and the Three

Sisters in Warnboro Sound. There are many interesting observations on the breeding habits of the Little Penguin (*Eudyptula minor* (J. R. Forster)), Silver Gull (*Larus novae-hollandiae* Stephens), Pied Cormorant (*Phalacrocorax varius* (Gmelin)), and others.

24. The Wood-Sandpiper. Jack Jones. 1943. *The Emu*, 43 (2) : 107–112. This species, *Tringa glareola* L., is rare in Australia. The author has summarized and discussed the available records including those of his own from the mouth of the Little River, Port Phillip Bay.

25. Additions to the Avifauna of the North Island, New Zealand. R. B. Sibson. 1943. *The Emu*, 43 (2) : 136–139. The author lists sight records (field glasses and telescope at less than 20 yards) from the North Island of the Hudsonian Godwit, *Limosa haemastica* (L.); Curlew Sandpiper, *Erolia ruficollis* (Pallas); and the American Pectoral Sandpiper, *Erolia melanotos* (Viellot). The Pectoral Sandpiper record might be questionable since the bird was immature and because of the similarity of this species to the Siberian Pectoral Sandpiper, *E. acuminata* (Horsfield). The Hudsonian Godwit record can be accounted for on the basis of its overlapping range in Alaska with the Bar-tailed Godwit, *Limosa lapponica baueri* Naumann, a common migrant to New Zealand. All three records are substantiated by previous records of the same three species on South Island.

26. Notes on Australian Birds (II). Ernst Mayr. 1943. *The Emu*, 43 (1) : 3–17. This interesting paper is primarily a revision of the Little Grebes (*Podiceps ruficollis* group), the Mangrove Herons (*Butorides striatus* sspp.), and Boobook Owls (*Ninox novaeseelandiae* sspp.) of northern Australia, Timor, and adjacent Lesser Sunda Islands. There are included also some interesting zoogeographical notes on these groups. The author agrees with Rand in the separation of *Podiceps novaehollandiae* from *P. ruficollis*. These two species breed side by side from New Guinea to New Caledonia. "It seems that *novaehollandiae* occurs in a number of isolated colonies from Java to New Guinea and New Caledonia. It is probable that *novaehollandiae* represents an earlier wave of immigration and *ruficollis* (*tricolor* group) a late Pleistocene one which now lives side by side with *novaehollandiae* in a number of places without interbreeding." It is suggested that the Australian Mangrove Herons represent two waves of immigration from the north, one from New Guinea and the other from the Lesser Sunda Islands, especially Timor.

27. Observations on the Distribution of the Wrybill in the North Island, New Zealand. R. B. Sibson. 1943. *The Emu*, 43 (1) : 49–62. Wrybills, *Anarhynchus frontalis* Quoy and Gaimard, are seen in small numbers on the North Island during the spring migration (July to September) southward and the fall migration (December to May) northward. The winter habitat of the majority of the species is the Firth of Thames or the harbors of Kaipara and Manukau. The nesting areas are on the South Island.

SYSTEMATIC ORNITHOLOGY

28. The Races of *Puffinus assimilis* in Australia and New Zealand. C. A. Fleming and D. L. Serventy. 1943. *The Emu*, 43 (2) : 113–125. The authors present a revision of the Little Shearwaters, *Puffinus assimilis*, of Australia and New Zealand. The subspecies recognized are *Puffinus assimilis tunneyi* Mathews, breeding on the Abrolhos Islands and the Archipelago of the Recherche; *P. a. assimilis* Gould, breeding on Norfolk and Lord Howe Islands; *P. a. kermadecensis* Murphy, breeding colonies on Meyer and Sunday Islands;

P. a. haurakiensis subsp. nov., breeding colonies on Hen Island, Chickens Islands, and the Mokohinau Group; and *P. a. munda* (Kuhl), the most distinctive of the subspecies and almost circumpolar in distribution, breeding localities unknown. In speaking of the origin of the modern groups of Least Shearwaters the authors suggest that "in the south *assimilis* is well differentiated from the tropical *lherminieri*, but in the North Atlantic *baroli* and *boydi* are less distinct though convergently approaching *assimilis* in some features."

29. Relationships of the Canada Jays in the Northwest. John W. Aldrich. 1943. *The Wilson Bulletin*, 55 (4) : 217–222. A careful examination of the subspecies of the Canada Jay, *Perisoreus canadensis* (L.), and the Oregon Jay, *Perisoreus obscurus* Ridgway, reveals that they intergrade in a manner characteristic of the subspecies of a single species. "Apparently the two characters that have been assumed to be specific, separating the *obscurus* from the *canadensis* group, are the immaculate underparts and the white shaft streaks of the dorsal plumage in *obscurus*." The author shows that specimens from central northern Washington and central southern British Columbia show complete integradation between the *canadensis* and *obscurus* groups. This population is described as a new subspecies, *Perisoreus canadensis connexus*. Nine other subspecies are recognized. A map shows the distribution of the ten *obscurus-canadensis* subspecies.

30. Notes on the Classification of Penguins. (Bemerkungen zur Systematik der Penguine.) H. von Boetticher. 1943. *Zoologischer Anzeiger*, 142 (1/2) : 22–28. The author agrees only in part with the revision by G. M. Mathews (Bulletin of the British Ornithologists' Club, 382, 1934) which recognizes four separate families of penguins and which reduces *Spheniscus demersus*, *S. magellanicus*, and *S. humboldti* to the status of a single species. It is suggested that the older concept of a single family be restored and that two subfamilies, Aptenodytinae and Spheniscinae, be recognized. In this scheme *demersus*, *magellanicus*, and *humboldti* are reduced to subspecies of *demersus* (as in Mathews) and with *S. mendiculus* comprise the Spheniscinae. The new genera of Mathews, *Catadyptes* and *Dasyrhampus*, are accepted and with *Eudyptula*, *Aptenodytes*, *Pygoscelis*, *Megadyptes*, and *Eudyptes* constitute the Aptenodytinae.

31. Suggestions Concerning the Generic Classification of Passerine Birds. (Vorläufiges zur Gattungssystematik der Passeres.) *Zoologischer Anzeiger*, 143 (7/8) : 179–191. This paper is concerned primarily with the subgeneric relationships within *Euplectes*, *Niobella*, *Coliuspasser*, *Estrilda*, and *Hirundo*. *Lagonosticta cinereovinacea* is placed in a new genus, *Euschistospiza*.

32. Some Notes on the Anatomical Differences between the Cuculidae and the Musophagidae with Special Reference to the Specialization of the Oesophagus in *Cuculus canorus* Linnaeus. Percy Lowe. 1943. *The Ibis*, 85 : 490–515. Because of the occurrence of a crop in the Cuculidae, the differences in feather tracts, and certain obvious osteological and myological differences the author insists that these families should not be placed in the same order.

HISTORY

33. The Last Passenger Pigeon Hunts of the Cornplanter Senecas. William N. Fenton and Merle H. Deardorff. 1943. *Journal of the Washington Academy of Sciences*, 33 (10) : 289–315. This paper, although primarily ethnological, is of interest in that it contains much interesting information on the relations of the Indians of eastern North America to the Passenger Pigeon, *Ectopistes migratorius* (L.). Most of the information comes from members of the

Cornplanter Band of Senecas in northwestern Pennsylvania. Pigeons were taken by the Indians as food long before the arrival of white man. Squabs were generally considered more palatable than the adults. "They (the Iroquois) allowed the birds to nest and to hatch their young; and the nests were not disturbed until the young were ready to leave. They believed that the practice of taking squabs at their prime and of allowing the adult birds to go free to reproduce the species was a measure of conservation, which was probably true under the circumstances." "The Iroquois regarded the annual return of the passenger pigeon as one of the blessings ordained by the Master of Life. The sudden arrival of great flocks of birds to nest in the neighboring forests not only relieved the economic strain at a period when they were sometimes reduced to eating their seed corn, but also justified their faith in the bounties of nature." Although some of the Iroquois set nets, both stationary nets on high places and trip nets at salt licks, the most common technique among these Indians was nest-raiding. Nest-raiding was the technique of the Senecas who used nets only when employed by white pigeoners. It is concluded, with apparent justification, that the Indians had little to do with the disappearance of the species.

BOOKS

34. A Guide to Bird Watching. Joseph J. Hickey. 1943. Oxford University Press. New York, London. xiv + 262 pp. $3.50.

During the last half century the popular study o birds has made great strides, not only in the enormously increased number of its devotees, but also in the quantity, quality, and point of view of the manuals for identification, state-lists, and other adjuncts to its literature. That something like the saturation point in both of these respects has been reached is suggested by the recent appearance of a few books with a wholly new approach to the subject; an approach that would have been uncalled for had there not already been a great number of bird students sufficiently well equipped with means by which to identify what they encountered afield, and by which to integrate their observations with what has already been recorded. This new approach, somewhat unfortunately called "bird watching," has brought into being a number of books, chiefly in England. Among them are James Fisher's "Watching Birds" and Nicholson's "The Art of Bird Watching," while over 40 years ago that solitary and, be it admitted, idiosyncratic, individualist, Edmund Selous, came out with "Bird Watching" and "A Bird Watcher in the Shetlands" among other works. To this small, but growing, list we may now add Hickey's volume. Unlike Selous, Hickey does not concern himself with what he has seen while watching birds, but gives his attention to the bird-watcher, especially the would-be bird-watcher, and supplies him with the answers and the guiding suggestions that are most likely to be of practical value to him. He explains how birds are named, how to learn to identify birds in the field by fleeting glimpses of plumage or by sound, how to keep his records and notes; he tells him all the little "tricks" the field man has of finding what birds there are in a given place, the best time of day, the best type of country, even the type of field glass to use.

After orienting the newcomer with these hints and advice, Hickey then introduces him to the ever recurring fascination of watching the annual goings and comings of birds in their migrations, and points out innumerable details still to be elucidated and in the study of which the amateur bird-watcher, no less than the so-called professional, can contribute material of value. To occupy the bird-watcher in the "between migration seasons" the author outlines the significance, the value, and the means of making accurate bird censuses, either of breeding or of wintering birds. Added to, and incorporated with, this is the matter of local distribution, involving such considerations as food supply, cover, water, nesting sites, singing perches, and, in a geographically broader sense, even

such items as life zones, biomes, etc. Another aspect of bird study to which the would-be bird-watcher is introduced is that of bird-banding and the host of bird-behavior problems it not only introduces but even makes possible to approach. Hickey gives the results of his own and other's experience in banding and handling birds, in building and maintaining trapping stations, in keeping records and in extracting the significant data from them. This leads to a consideration of the various opportunities open to the student in exploring the lives of even our commonest, supposedly best-known birds, and to the need for cooperative studies either in a single area or in a series of adjacent places.

An appendix of five sections unfolds to the newcomer the study of bird tracks (this I think is accepted too whole-heartedly by the author), the results of breeding bird censuses, a very elaborate and detailed outline for a life history study (an ideal to aim at rather than a goal to hope to achieve), an annotated list of bird books, and finally, a list of bird clubs in Canada and the United States.

The book is decorated rather than illustrated by tastefully executed sketches by Francis Lee Jaques, and is well indexed.

The most striking omission, and this may be a deliberate and therefore a significant one, is the absence of any mention or instruction regarding bird photography. Another omission, which will catch the eyes of the "old timers" particularly is the lack of instructions regarding collecting and preserving specimens, yet the reviewer feels satisfied that the author is well aware of the fact that in life history studies it not infrequently becomes necessary to shoot birds to check on observations, especially in cases where the sexes or ages look alike. In a manual of how to study birds a few pages could have been given to these two still useful methods of getting the data needed in life history work. It is true that photography as an end in itself contributes little to knowledge of birds, but as a means of conveying certain types of data it has a definite place. (For example, courtship poses, nesting sites, etc., are more readily portrayed than described.)

A book is both a record and a tool. As a record of what has been done and as a manual of the methods involved the value of the present book is indicated in the above review. As a tool in the hands of present and future bird-watchers its value remains to be demonstrated. It is written in such a way as to lend itself admirably for classroom purposes. More and more, people are realizing the value of a satisfying and instructive hobby in even the busiest life, and when bird-watching is taught as a source of pleasure, much as literature and music are taught, Hickey's book may well prove to be a veritable key to a new world of interests and joys to many who would otherwise never sample of its pleasures.—HERBERT FRIEDMANN.

35. Stroud's Digest on the Diseases of Birds. Robert Stroud. 1943. St. Paul. L. G. Marcus, agent for the author. ix + 483 pp. $5.00. This unusual book has been purposely prepared in as completely non-technical language as possible in order to make its information usable to those without technical knowledge of histology, pathology, or pharmacology. The arrangement is that of an encyclopedia with its various items in alphabetical order. Included are anatomical terms, physiological terms and conditions, pathological terms and conditions, drugs and chemicals used in the therapy of avian diseases, pathogenic organisms, nutrition (including vitamins), treatment of injuries, etc. The information is drawn almost exclusively from the author's own experiments and extensive experiences largely with cage canaries. Material on the diseases of poultry is also introduced. The illustrations are in general helpful although some of them have been drawn from memory. There is a good discussion on the role of vitamins in the physiology of birds and the symptoms of the various avain avitaminoses. The section on malaria contains no suggestion for treatment in spite of the fact that several species of birds are used regularly as test animals

for various anti-malarial drugs. Many of these experiments should give reliable information on the therapeutics of malaria in birds. There is a glossary which defines the relatively small number of technical terms employed in the text. Readers may justifiably wonder why extraneous remarks and information are inserted in various places. Nevertheless its description of more than seventy diseases and pathological conditions, their diagnoses and treatments, obviously based on practical experience make this a valuable treatise. It is recommended particularly to those ornithologists whose investigations involve the keeping of birds in captivity.

36. Cuban Ornithology. Thomas Barbour. 1943. Memoirs of the Nuttall Ornithological Club, No. 9. 144 pp. This attractive volume is a successor to the author's *Birds of Cuba* published in 1923. He has incorporated notes accumulated in his annual visits to Cuba since the publication of the earlier treatise. Other records including those derived from the returns on banded birds are also added. Although there is no bibliography the introduction contains a discussion of the best sources of information on the birds of Cuba. The organization of the book is that of an annotated list of the known species. The notes deal primarily with collecting records, migration dates, breeding habits, relative abundance, and ecology. Scientific, English, and Cuban names are given and descriptions are omitted. This treatise will prove to be an interesting and invaluable source of information on Cuban birds.

BIRD-BANDING

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

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